

FOR THE CHIEF
Server 5

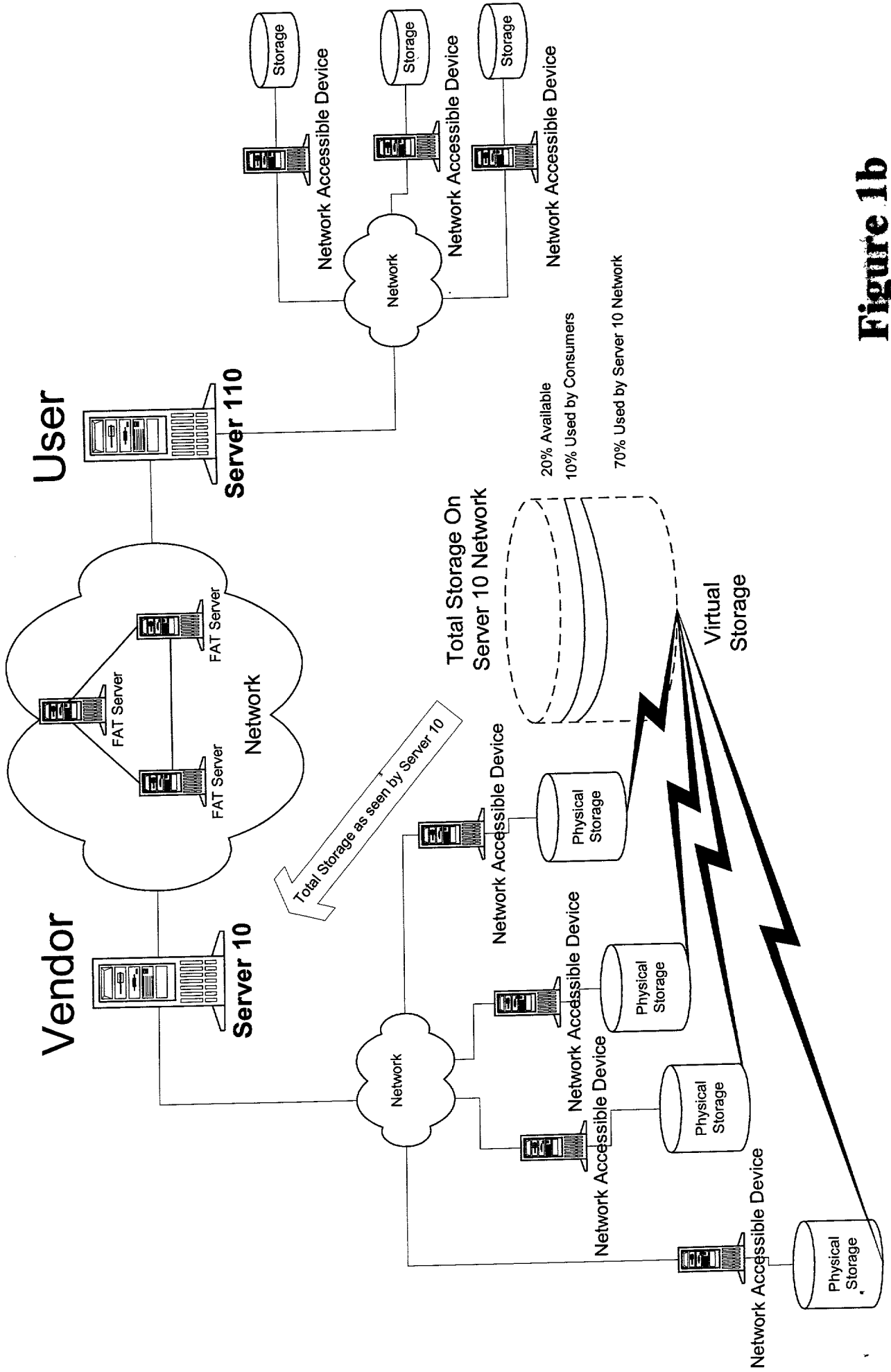


Figure 1b

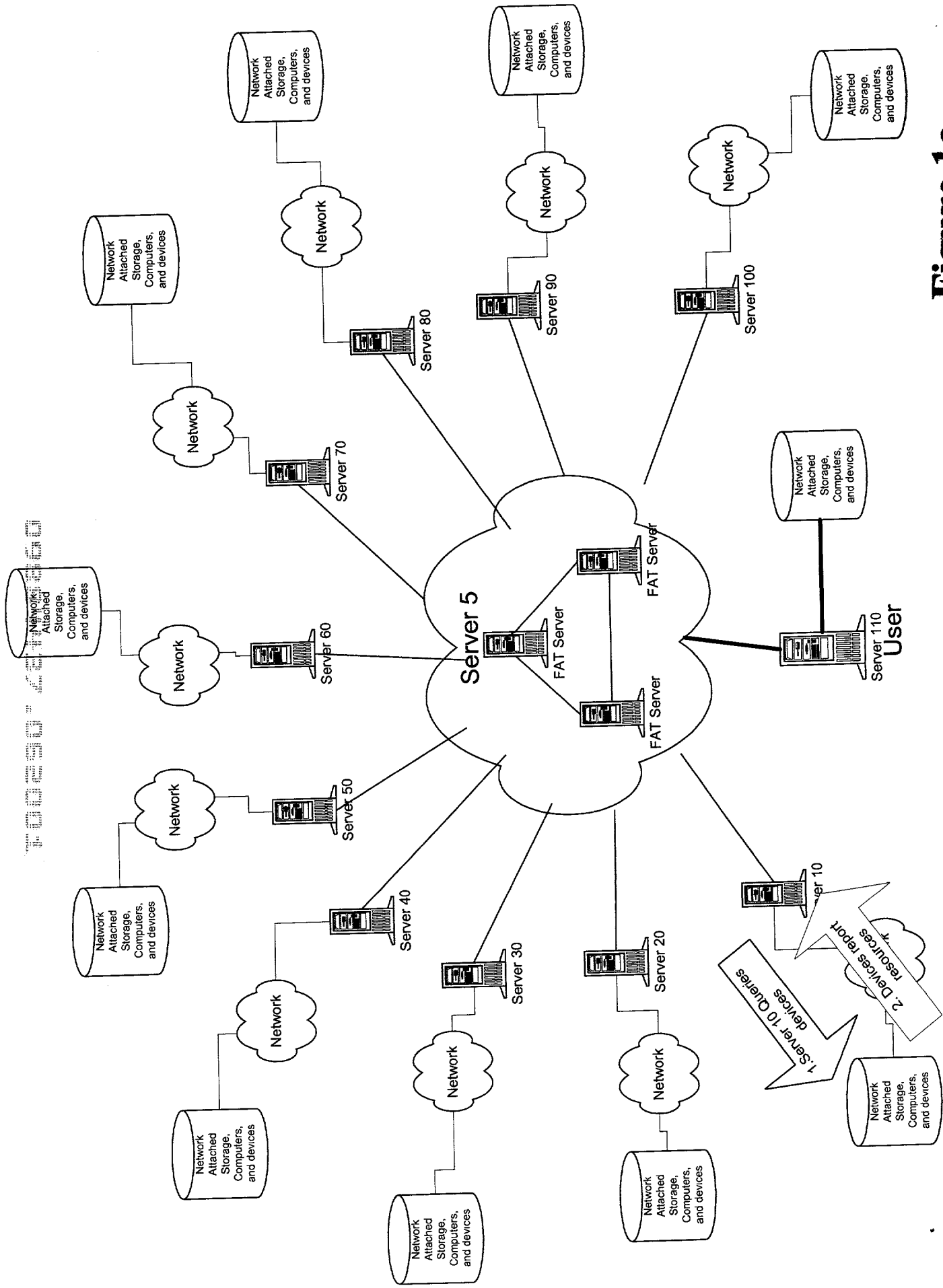


Figure 1c

Networked attached storage devices report to attached server.

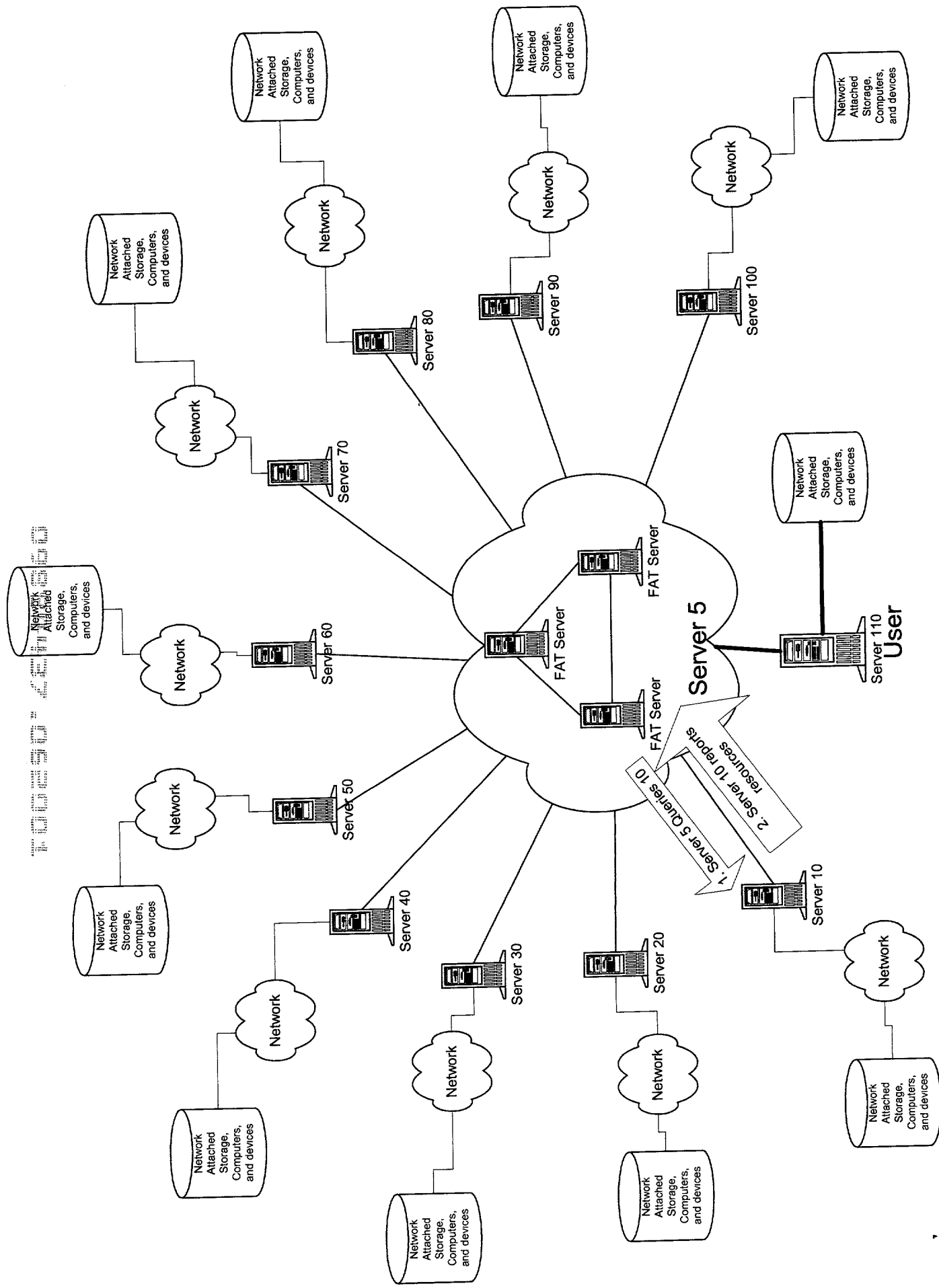


Figure 2

Vendor Servers wishing to offer storage report their resources to Server 5 for compiling a comprehensive File Allocation Table.

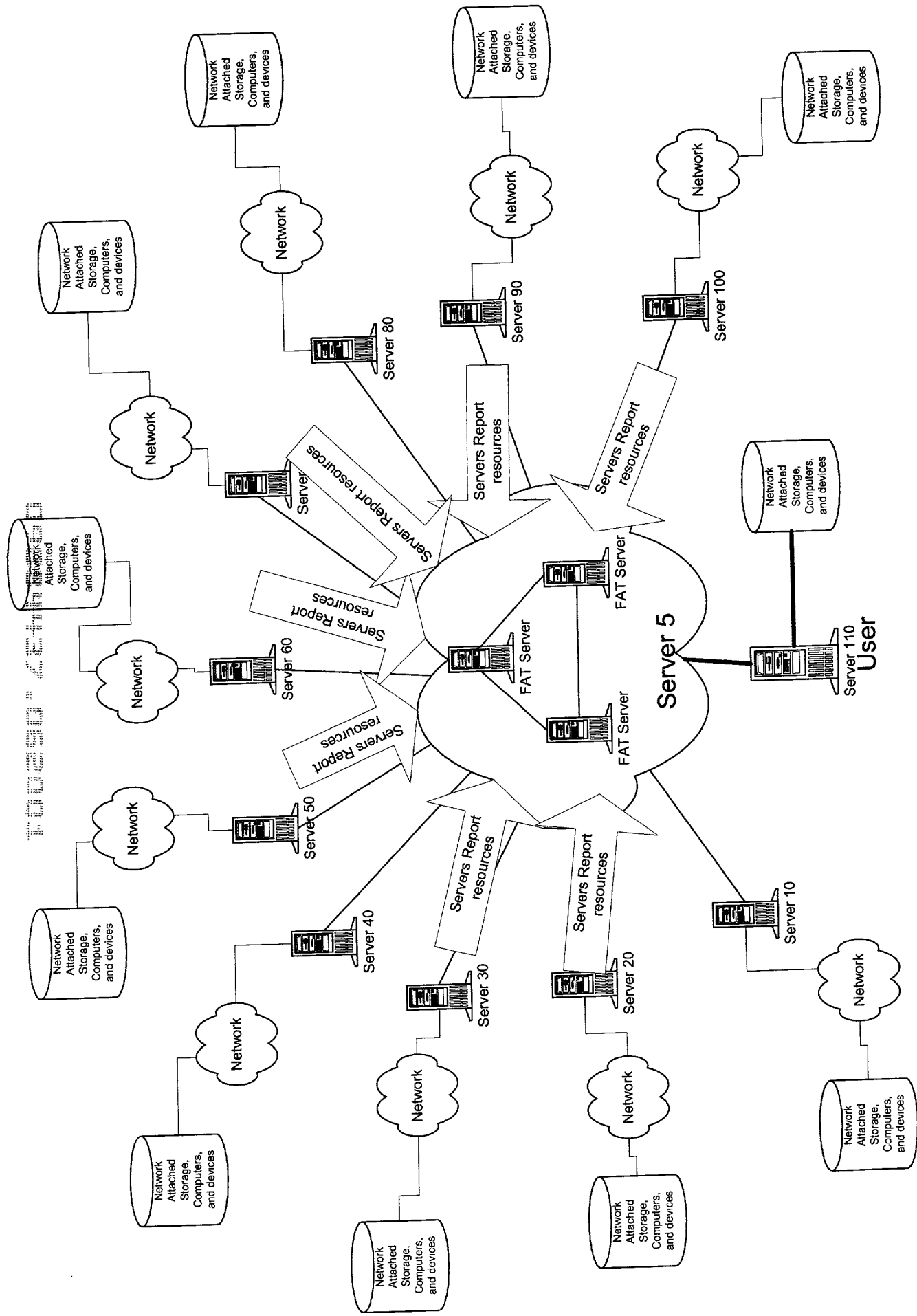


Figure 3

Vendor Servers wishing to offer storage report their resources to Server 5 for compiling a comprehensive File Allocation Table.

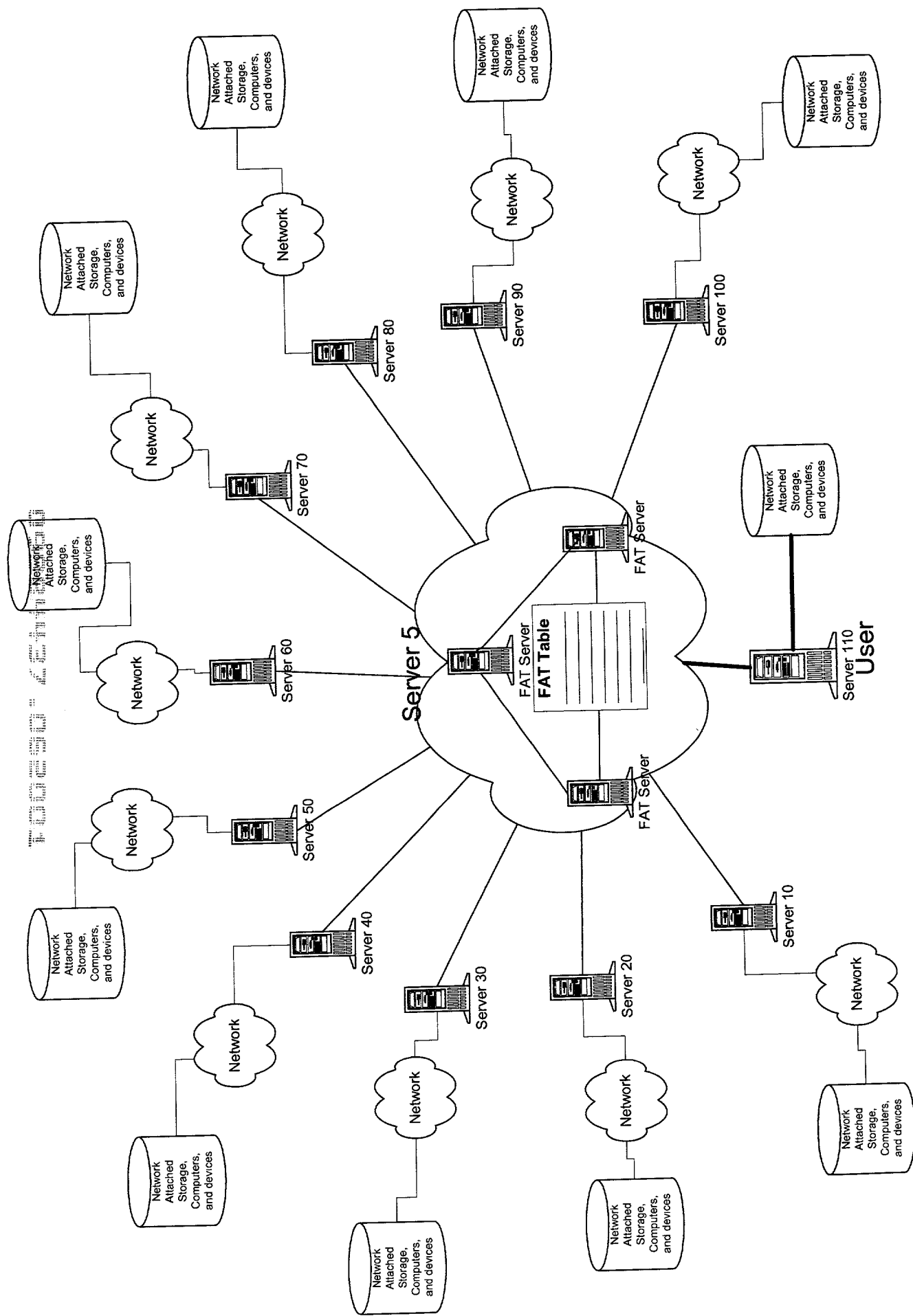
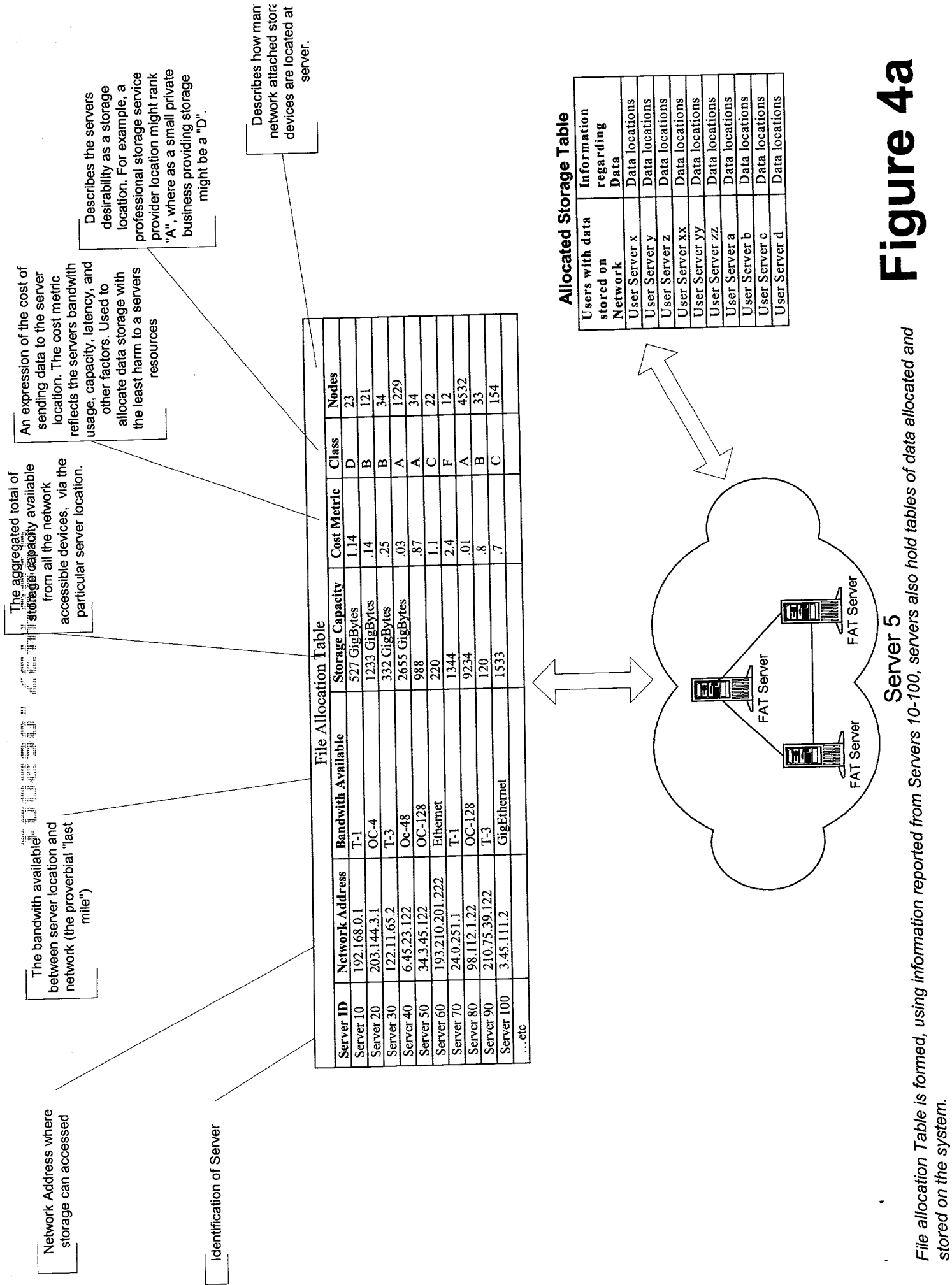


Figure 4

Server 5 forms comprehensive File Allocation Table identifying all storage available on the network, and the characteristics of each storage location.



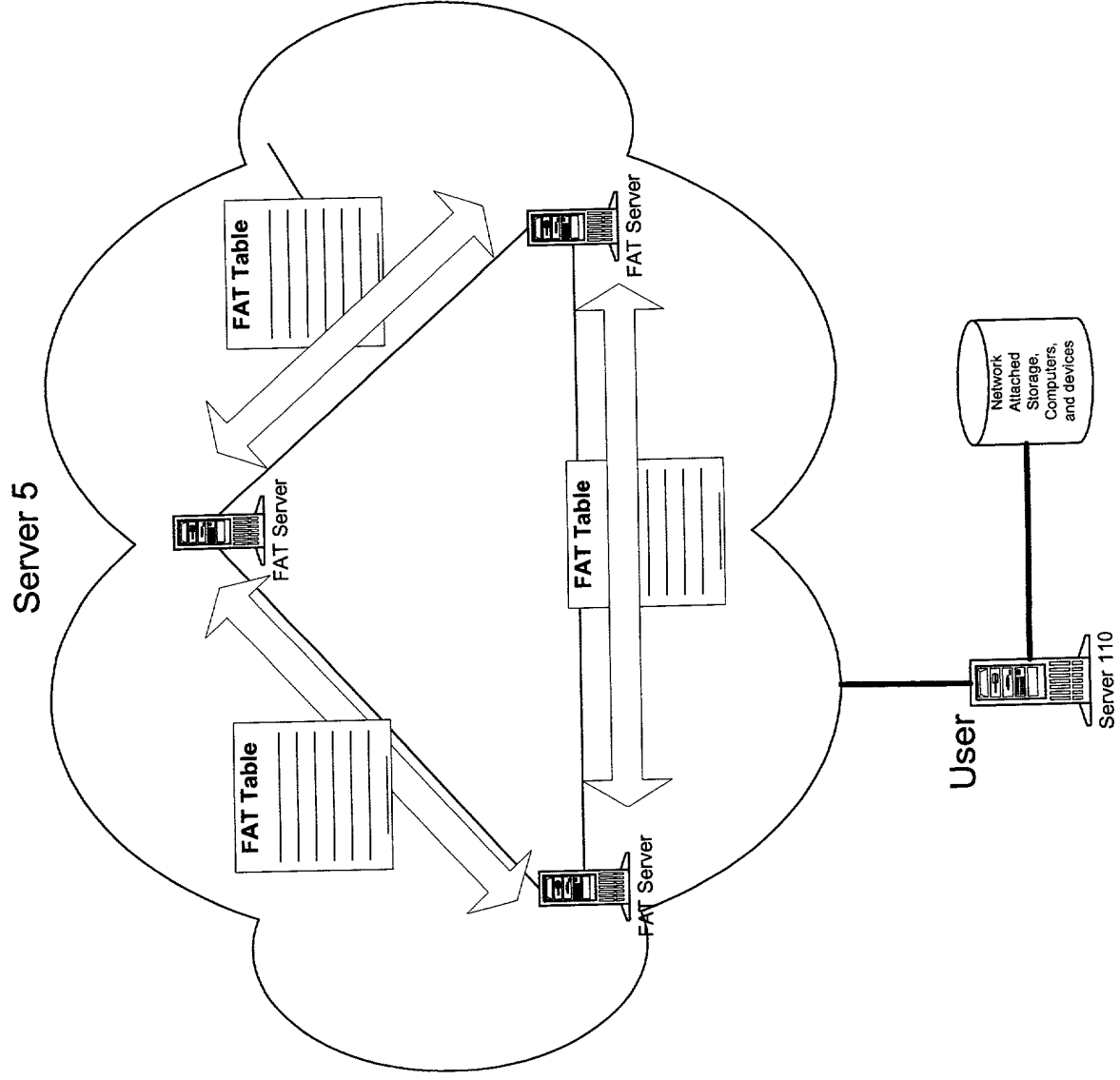


Figure 4b

Server 5 consists of several computing systems, for redundancy and availability of the FAT tables. The FAT tables are therefore mirrored on each individual FAT server. Each individual FAT server will have the same data.

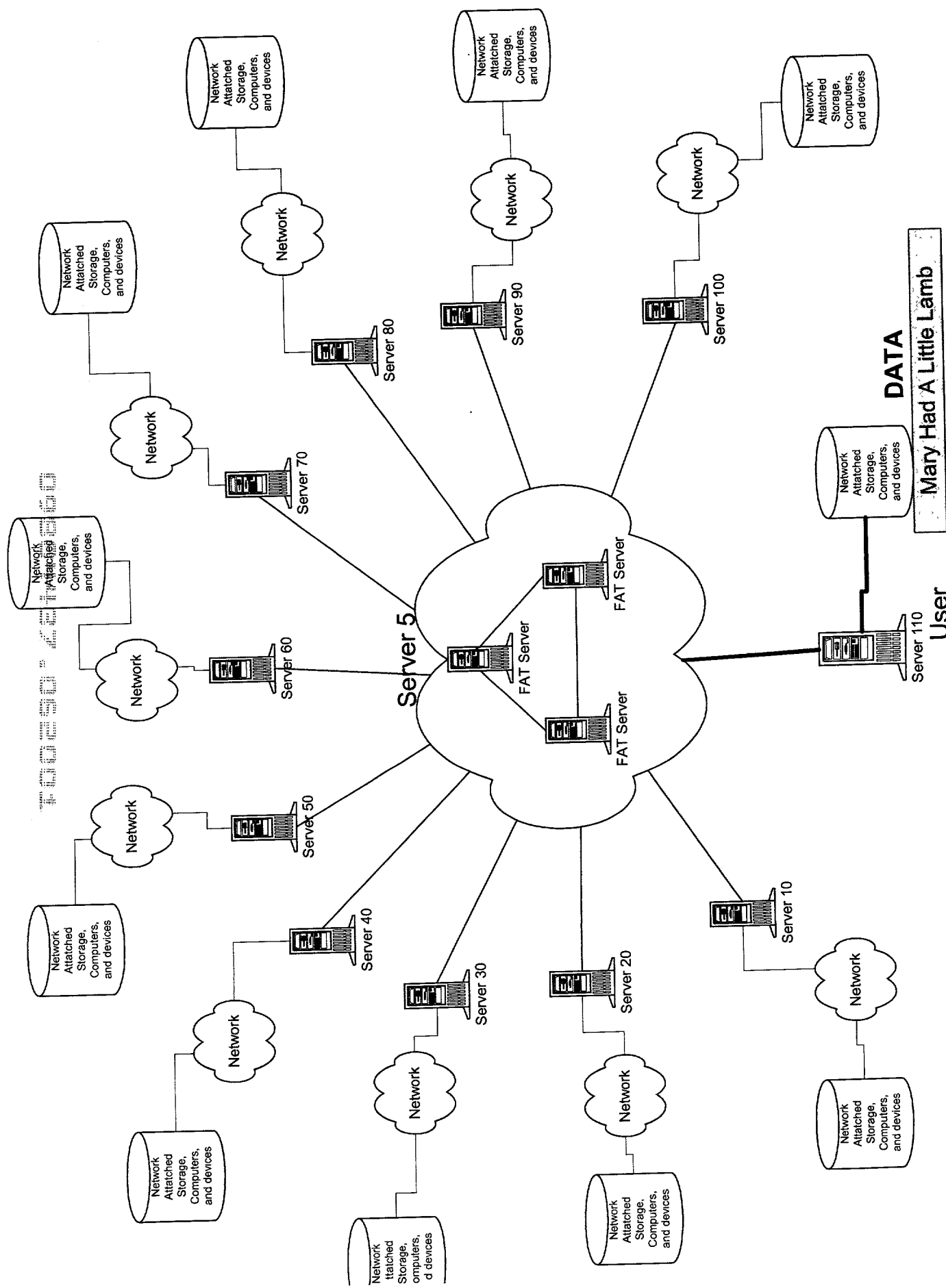


Figure 5

User, Server 110, requires storage services, either for itself, or for a network attached device on the Server 110 network.

1. Raw data needs to be stored.
2. The data is compressed
3. The data is encrypted
4. The data is chunked
5. The data is encapsulated with new protocol

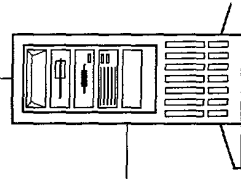
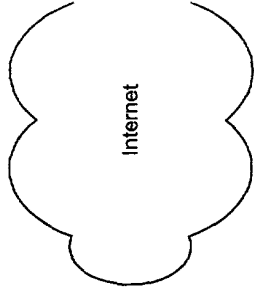
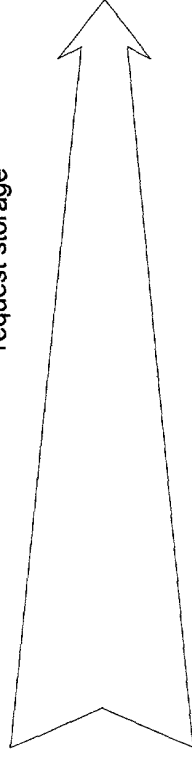
"Mary Had A Little Lamb"

Mary Had A Little Lamb

MaryHadALittleLamb

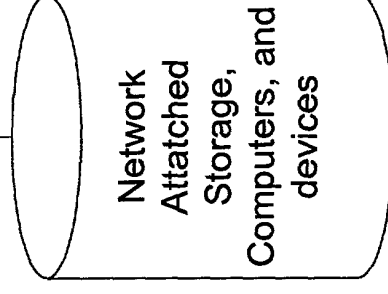


6. Server 110 ready to request storage



Server 110

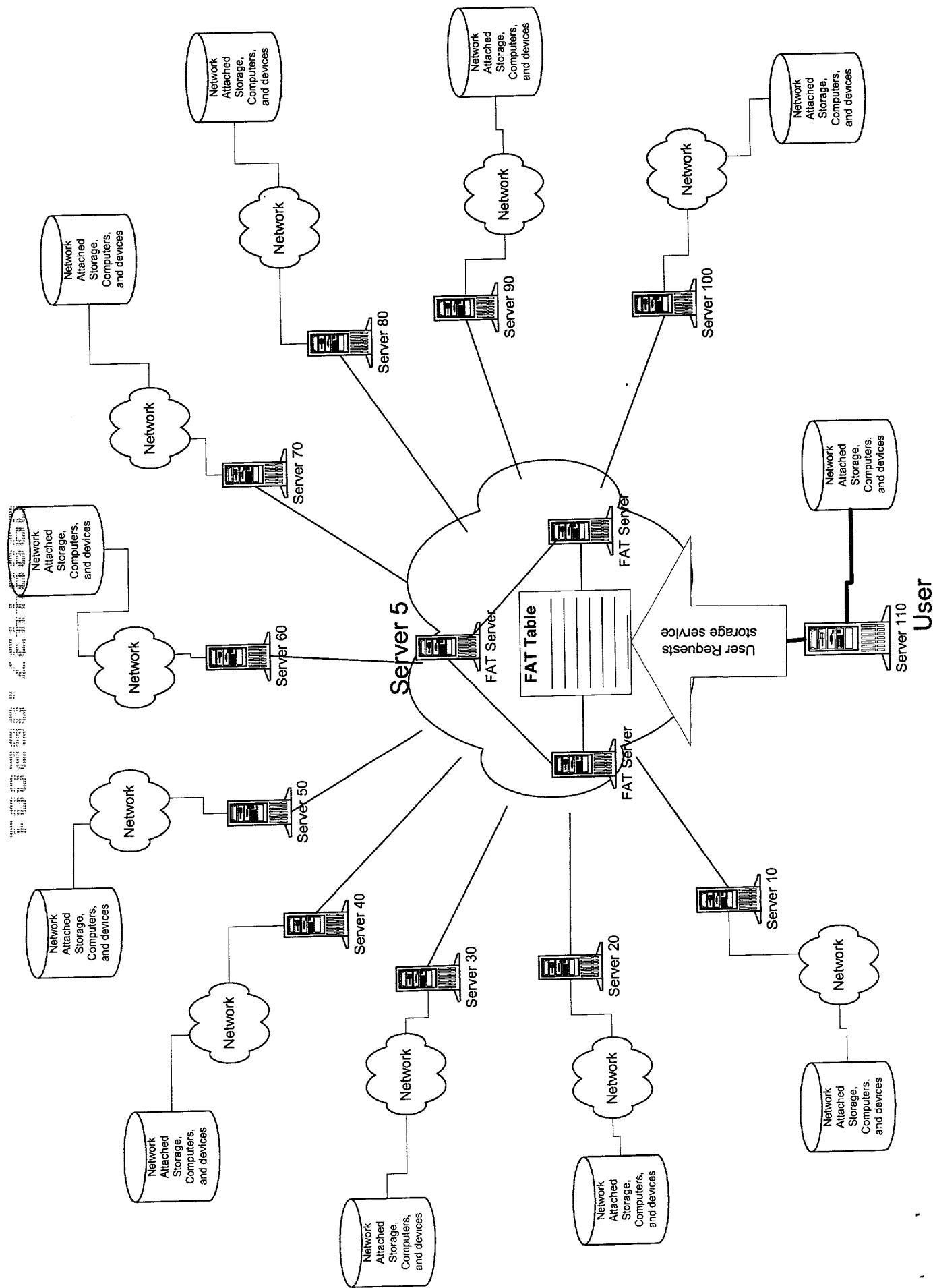
User



Data Bundling

System software on server 110 network prepares data in preparation of offloading the data onto the system.

Figure 5a



User requests storage service, requires a portion of the storage found in the File Allocation Table found on Server 5

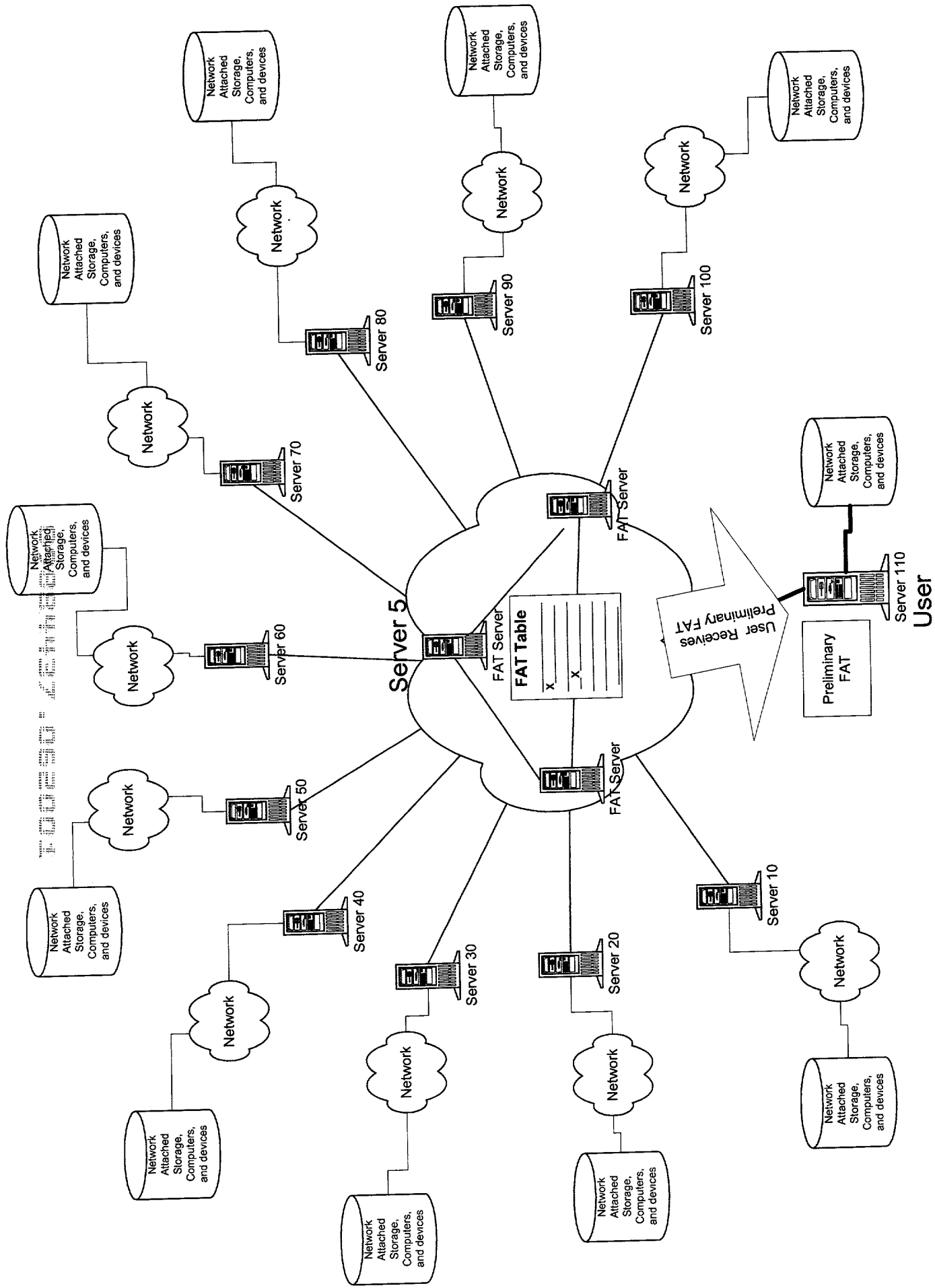
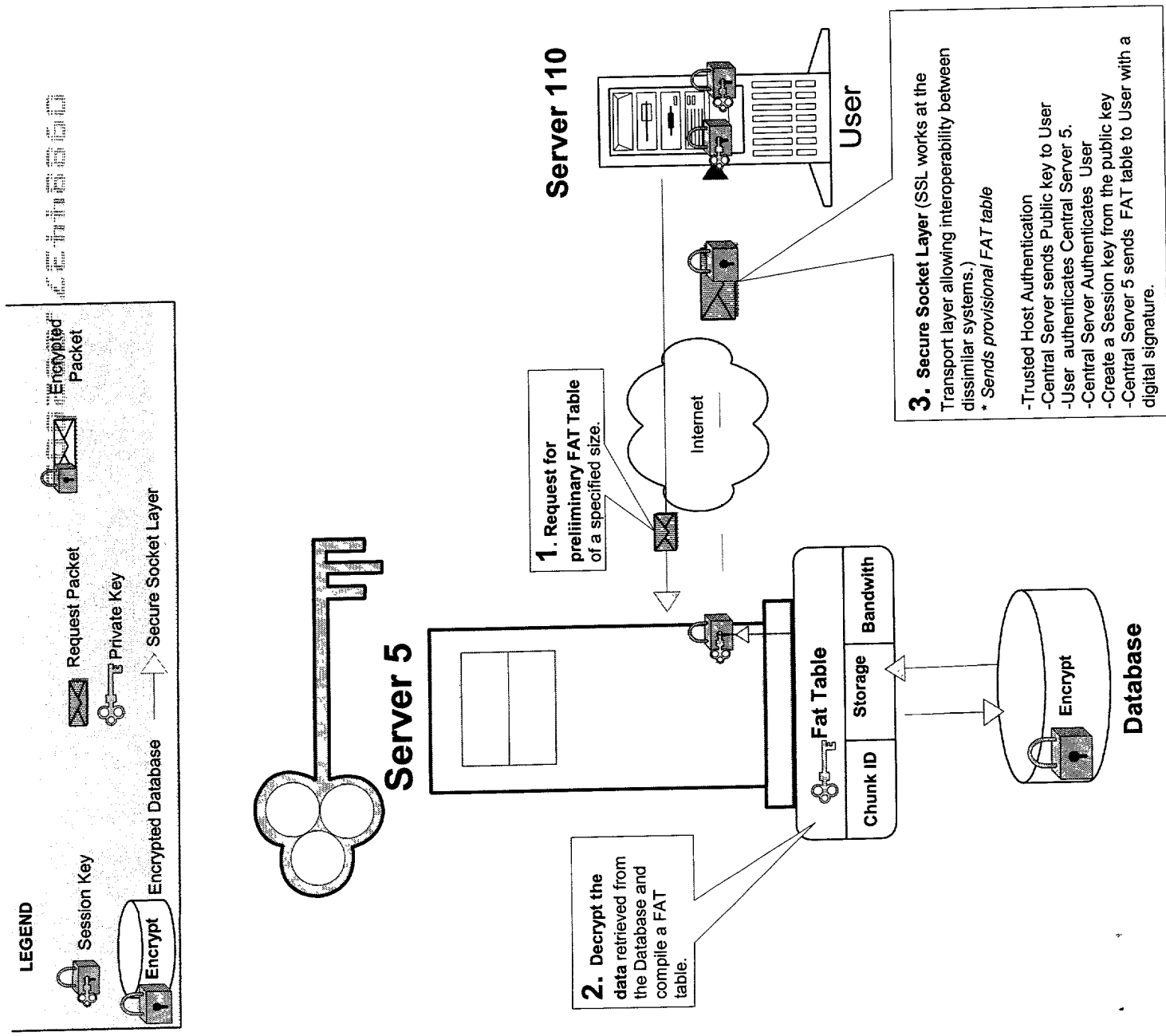


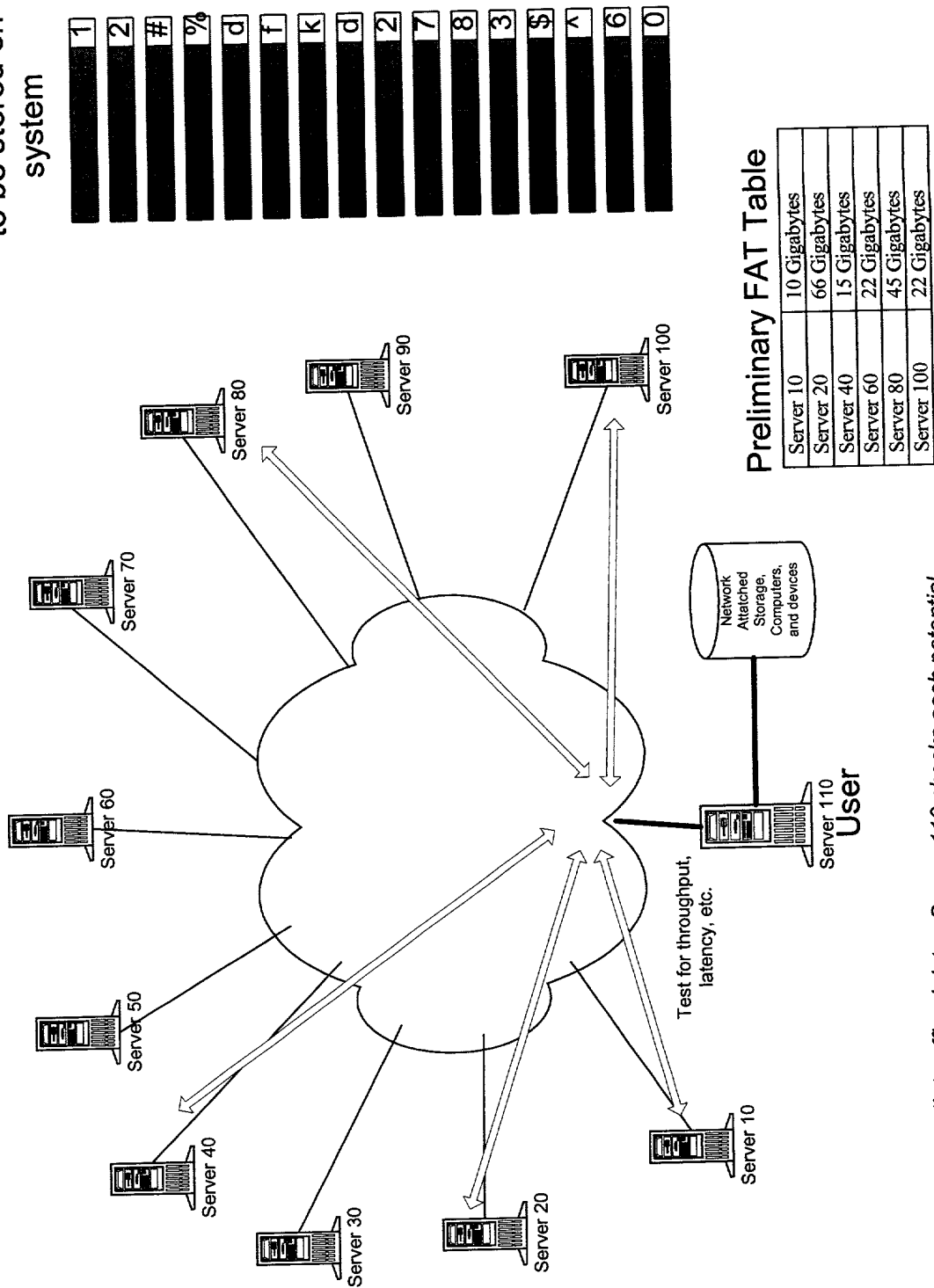
Figure 7

Server 5, the File Allocation Servers, sends Server 110 a provisional FAT table, allocating storage space. Server 5 marks on the central FAT which records it has released to server 110, and locks those storage records so that no other user can use those storage resources.



User requests storage service, requires a portion of the storage found in the File Allocation Table found on Server 5

Data on or
accessible to
User Server 110,
to be stored on
system



The user, Server 110, searches for an optimum path to offload data. Server 110 checks each potential location in the provisional FAT table paths for optimum path; latency, hop count, availability, etc.

Data on or
accessible to
User Server 110,
to be stored on
system

1
2

%
d
f
k
d
2
7
8
3
\$
^
6
0

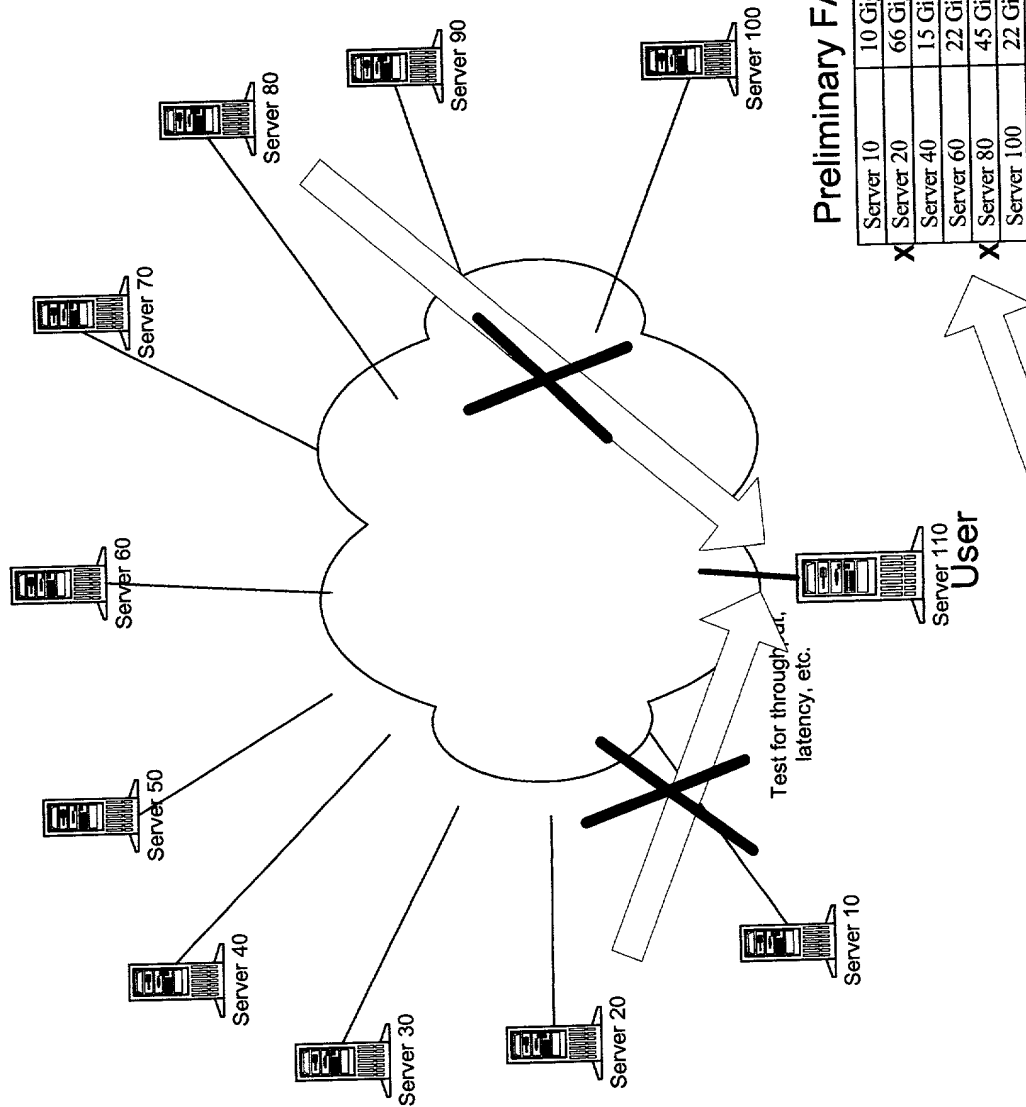
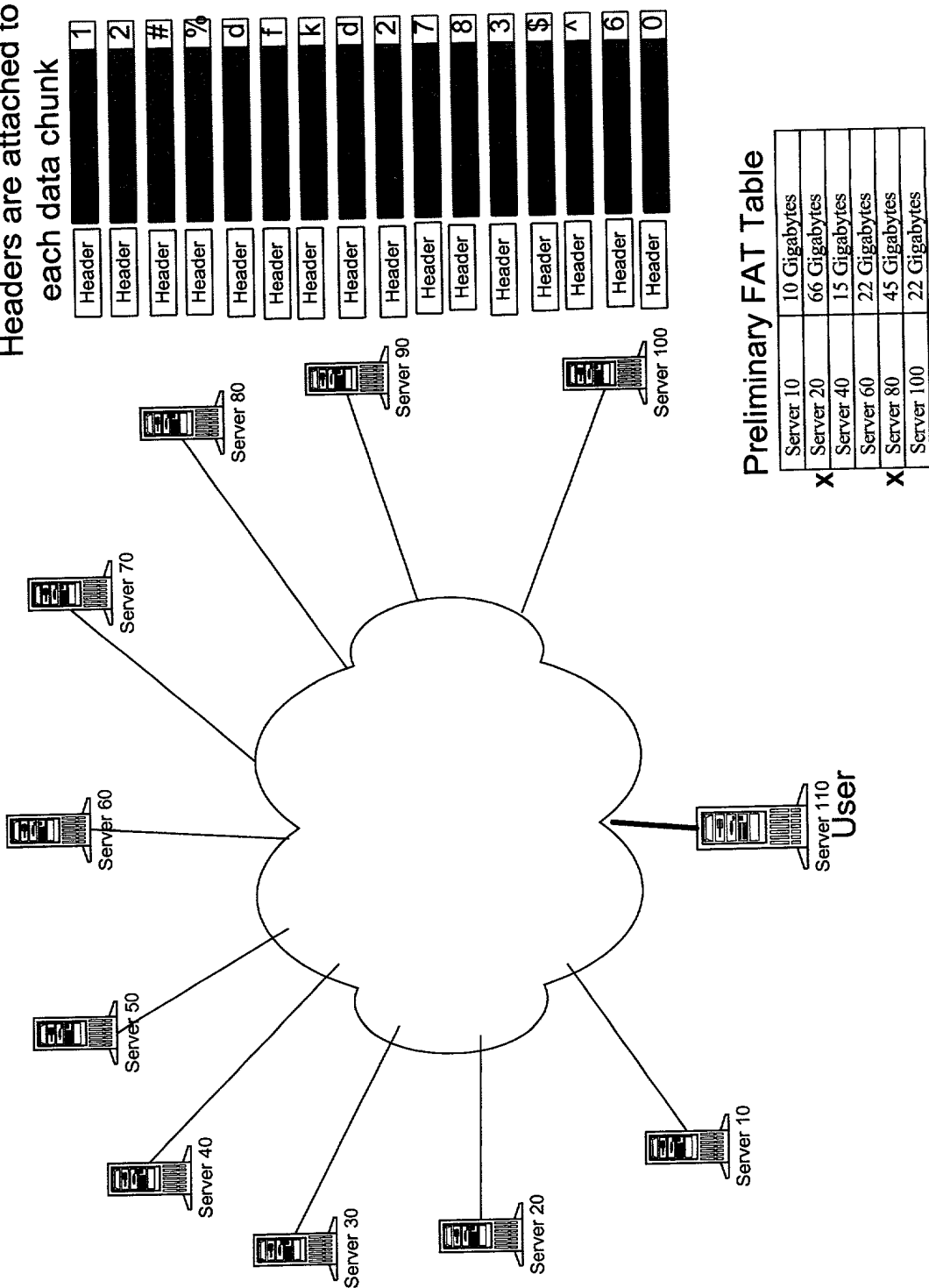


Figure 9

Server 110 discards certain server locations as undesirable for offloading.

Data on or accessible to User Server 110, to be stored on system-- Headers are attached to each data chunk

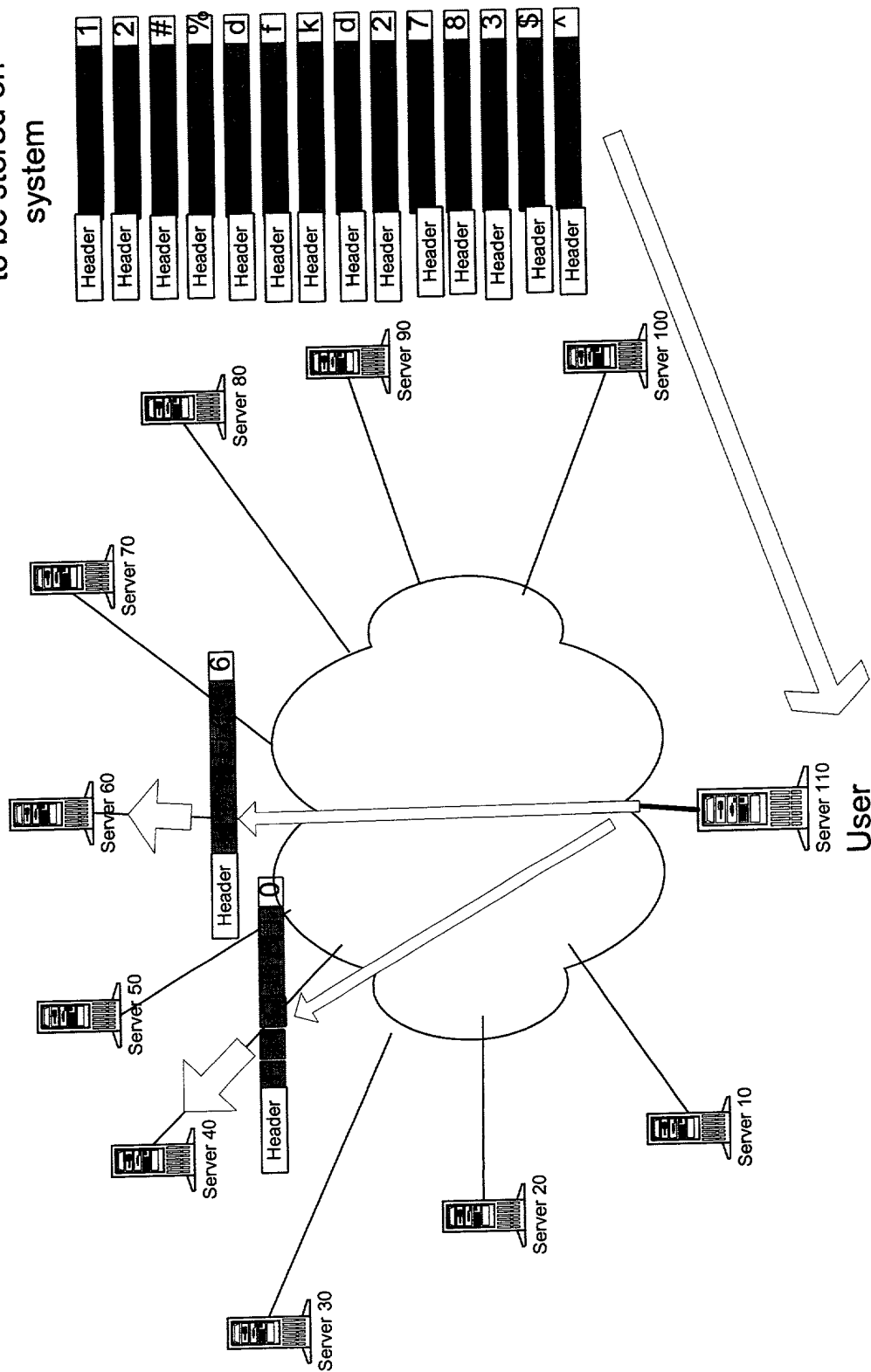


Headers are attached to the data chunks, individually. The header identifies that the data belongs to Server 110, where the data is to be sent, where the data is to be resent for duplication, and how much the data needs to be chunked further at each vendor server location to further protect the data.

Figure 10

Figure 11

Data on or
accessible to
User Server 110,
to be stored on
system

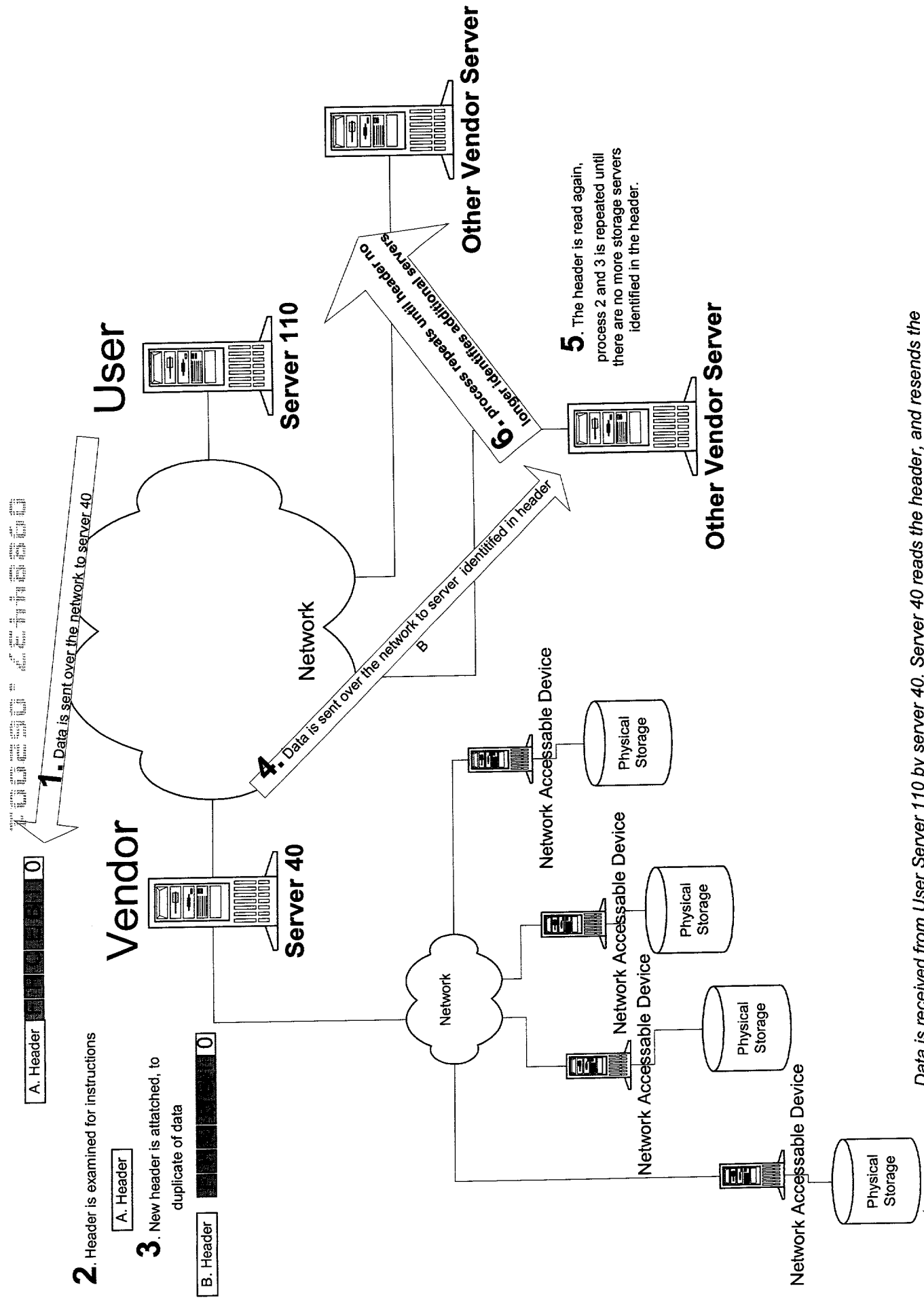


Preliminary FAT Table

Server 10	10 Gigabytes
Server 20	66 Gigabytes
Server 40	15 Gigabytes
Server 60	22 Gigabytes
Server 80	45 Gigabytes
Server 100	22 Gigabytes

Server 110 sends data to servers for storage.

Figure 11



Data is received from User Server 110 by server 40. Server 40 reads the header, and resends the data chunk if the header identifies another location for the chunk to be delivered to, ie, another vendor server. Server 40 removes itself on the list of storage locations from the header, and reapplies the header to the data and resends the data.

Figure 12

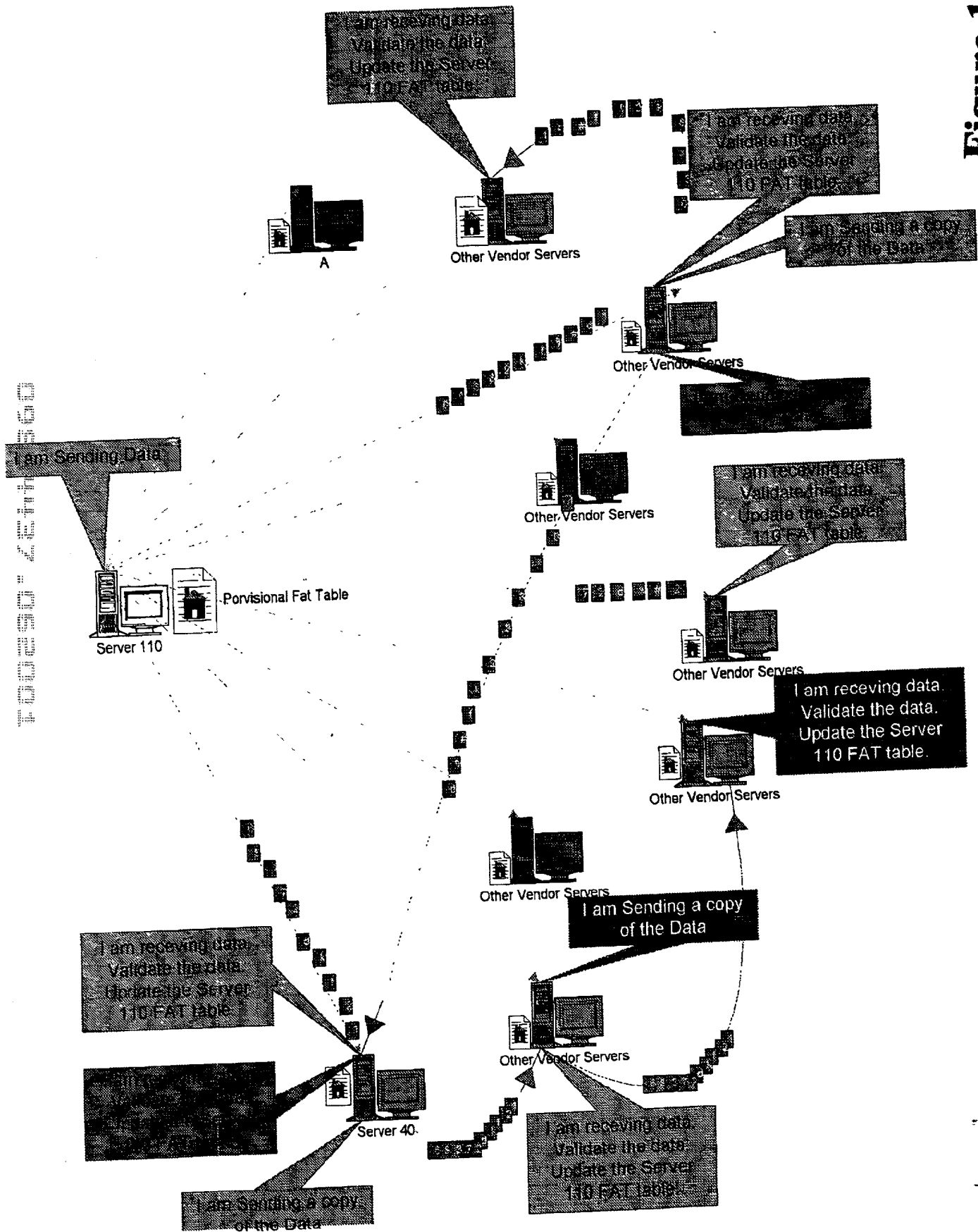


Figure 12a

A. Header	1	2	3	4	5	6	7	8	9	0
-----------	---	---	---	---	---	---	---	---	---	---



4. Data is more finely chunked for distribution on LAN

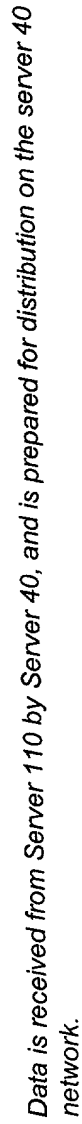
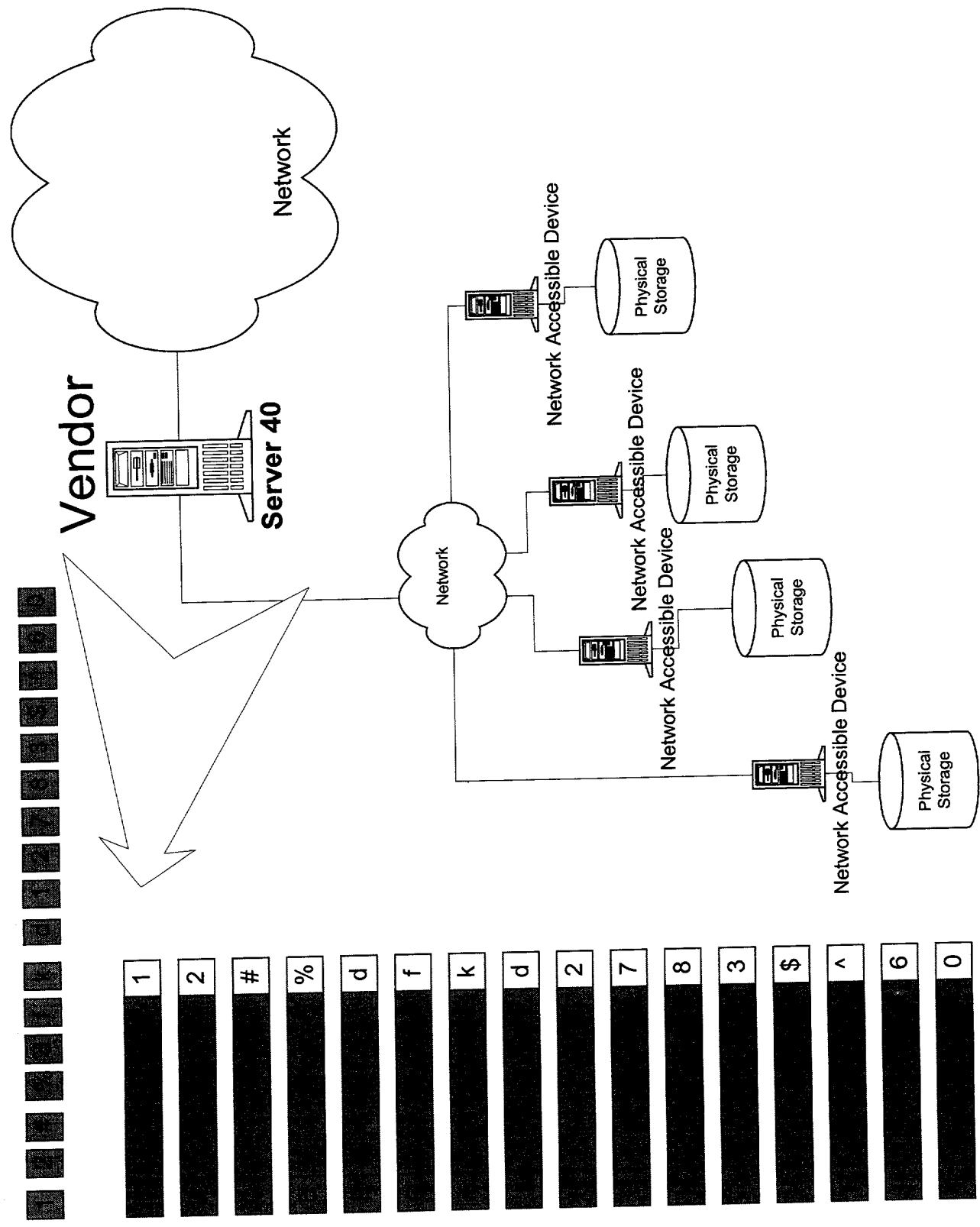


Figure 13a

0 1 2 3 4 5 6 7 8 9 a b c d e f

5. Data is more finely chunked by Server 40 for delivery on LAN

6. Data is encapsulated by Server 40 with protocol for retrieval, identification, and distribution, etc.



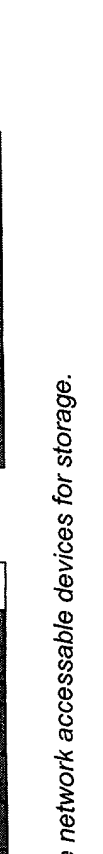
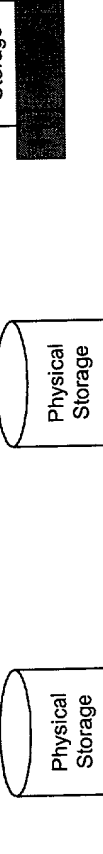
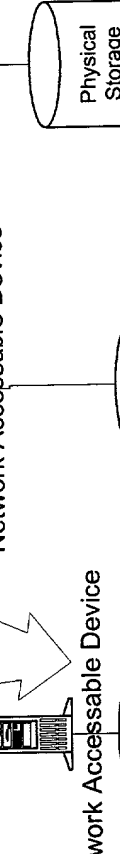
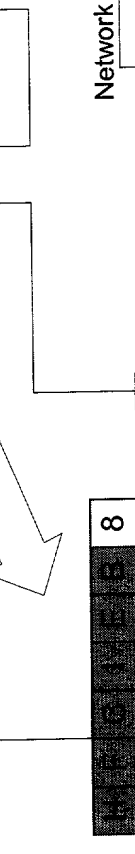
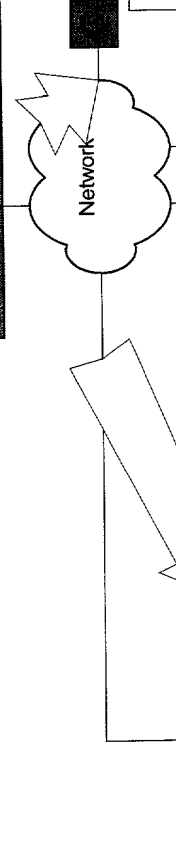
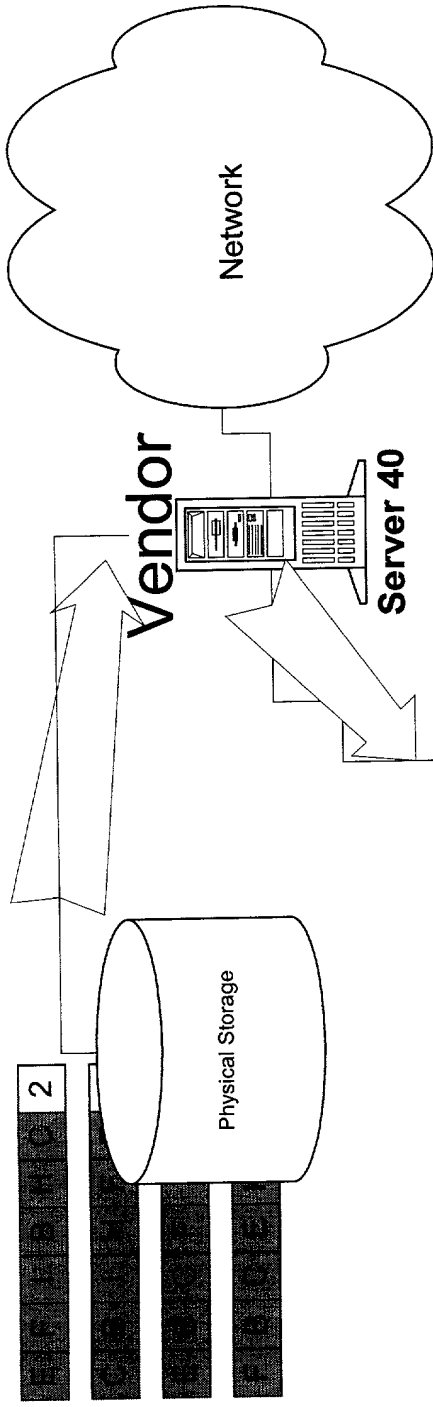
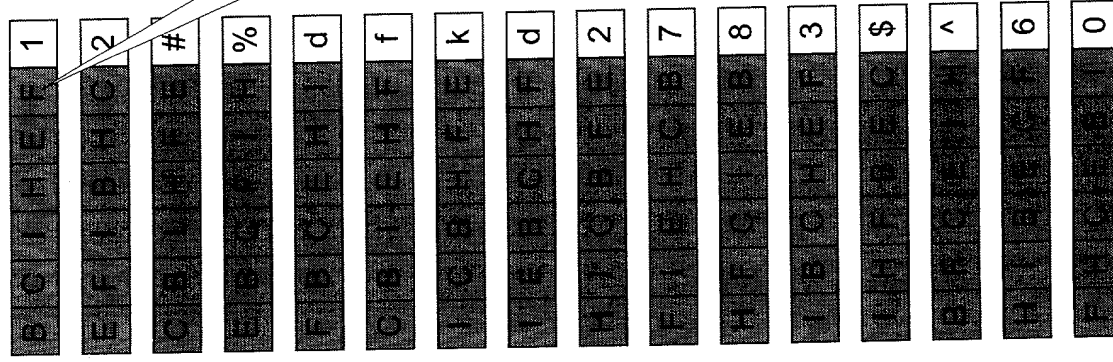
Server 40 reads in the header the instructions as to how much to re-chunk the data before distribution on the Server 40 network. Server 40 will rechunk the data at least as much as the header requests.

Figure 13b

Transfer Buffer

7 Data is distributed by Server 40 to network attached devices for storage

Cached Local Copy



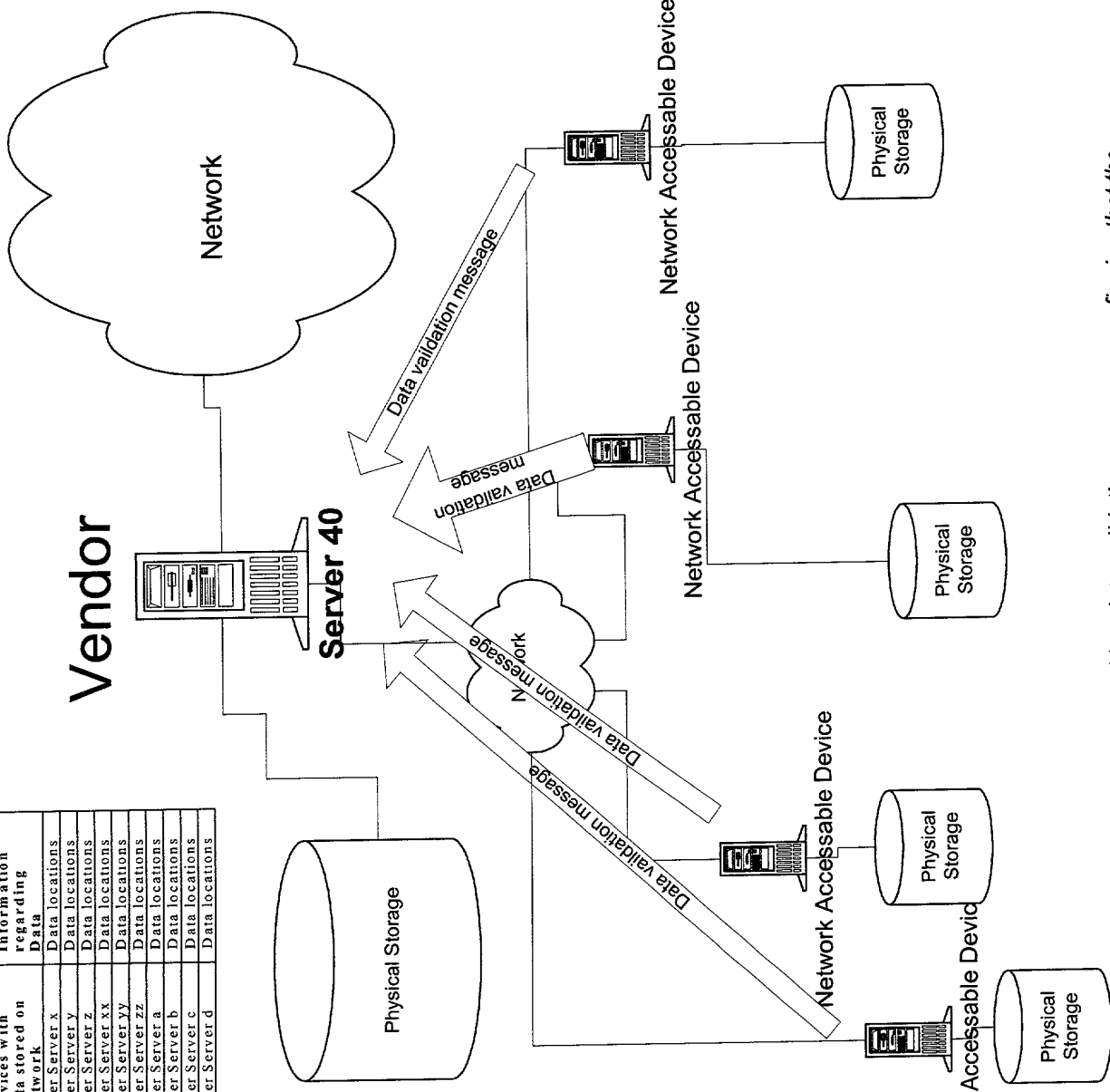
Server 40 sends server 110's data to the network accessible devices for storage.

Figure 13c

Server 40 Local FAT

B	C	I	H	E	F	1
E	F	B	H	C	2	
C	B	I	H	E	#	
E	F	B	H	C	%	
F	B	C	E	N	d	
C	B	I	H	E	f	
I	C	B	H	E	k	
I	E	B	C	H	d	
H	I	C	B	E	2	
F	I	E	H	C	7	
H	E	C	I	E	8	
I	B	C	H	E	3	
I	H	F	B	E	\$	
B	F	C	B	I	^	
H	I	B	E	C	6	
F	H	O	P	I	0	

Devices with data stored on Network	Information regarding Data
User Server x	Data locations
User Server y	Data locations
User Server z	Data locations
User Server xx	Data locations
User Server yy	Data locations
User Server zz	Data locations
User Server a	Data locations
User Server b	Data locations
User Server c	Data locations
User Server d	Data locations



Network accessible devices on the server 40 network respond to server 40 with a data validation message, confirming that the data was successfully stored. If no data validation message returns for a particular data chunk, the chunk is either resent or sent to a different device on the server 40 network. Server 40 compiles and stores local File allocation table for the data stored on the Server 40 network

1
2

%
d
f
k
d
2
7
8
3
\$
^
6
0

For clarity

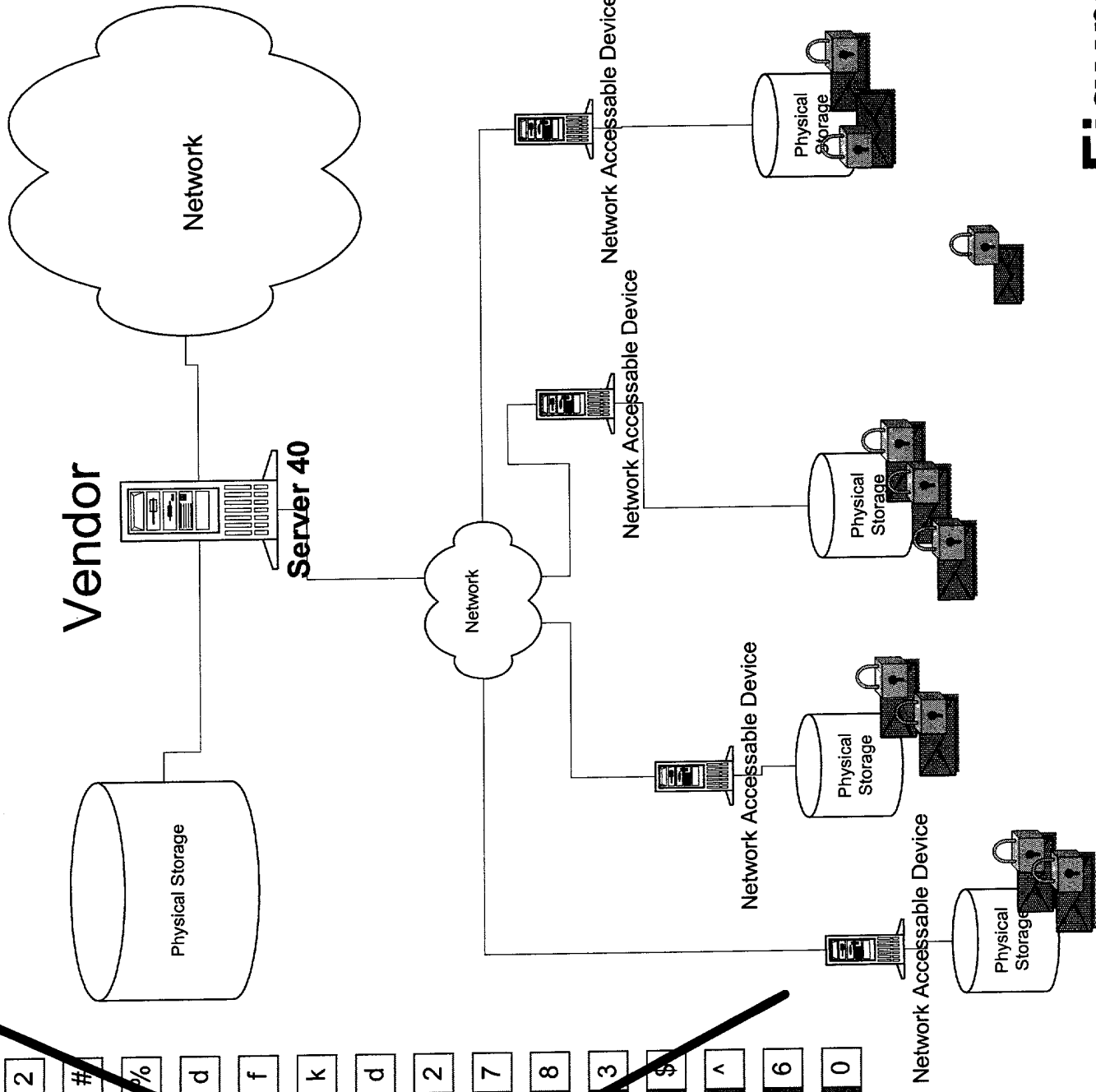
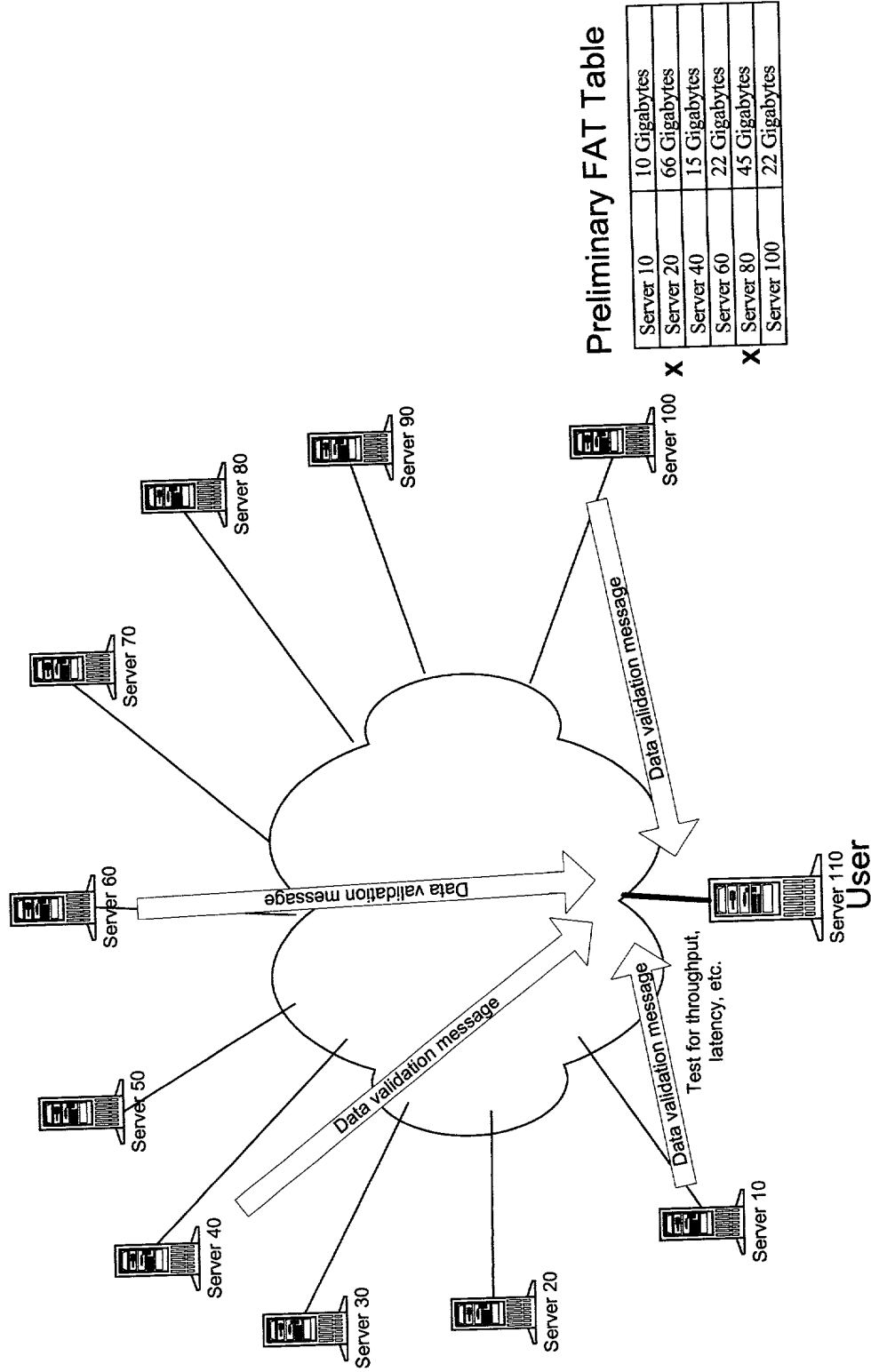


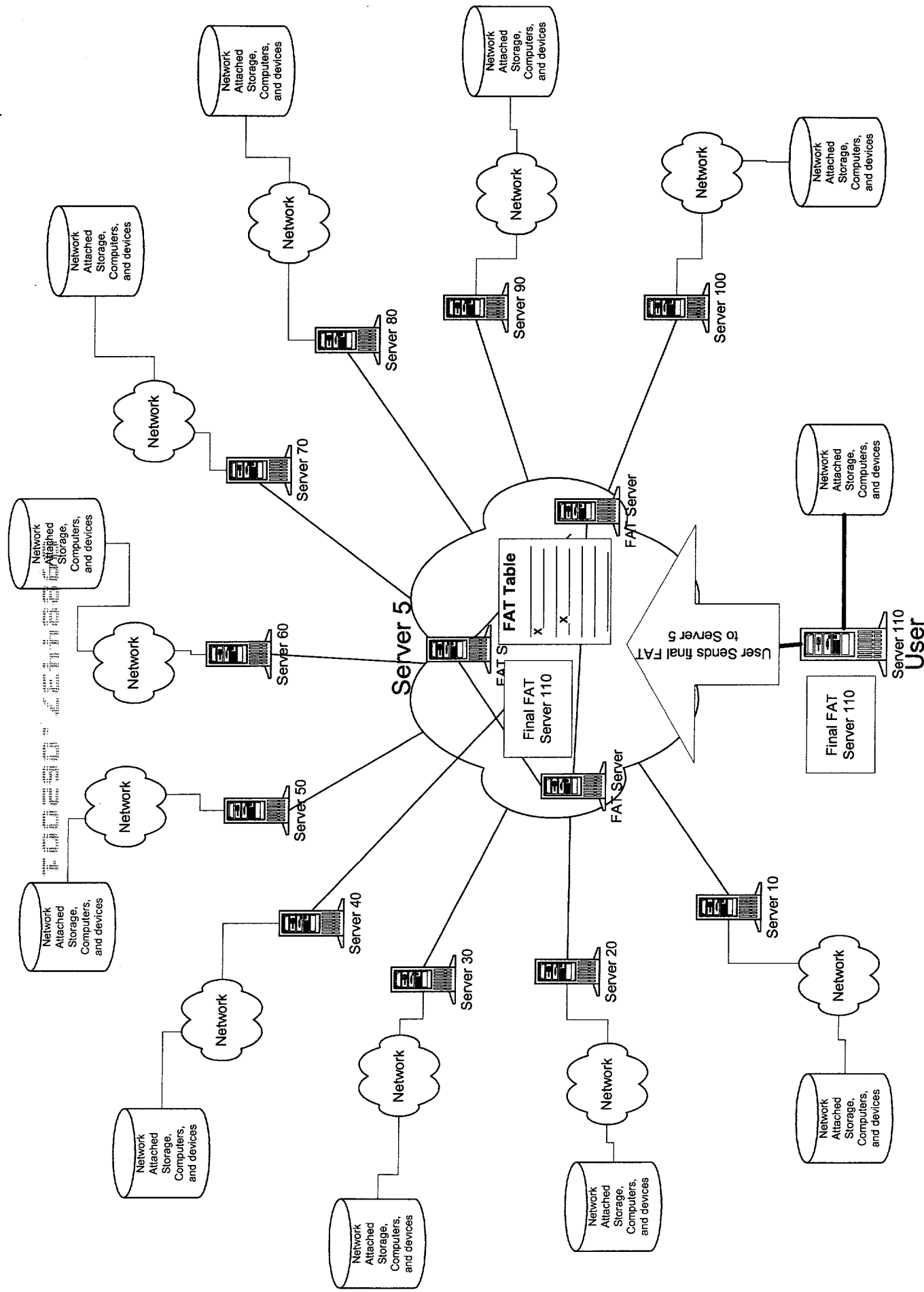
Figure 13e

Server 40 receives validation messages from Network accessible devices, and is free to erase the Server 40 local copy of the data. Server 40 maintains a record of where the data resides.

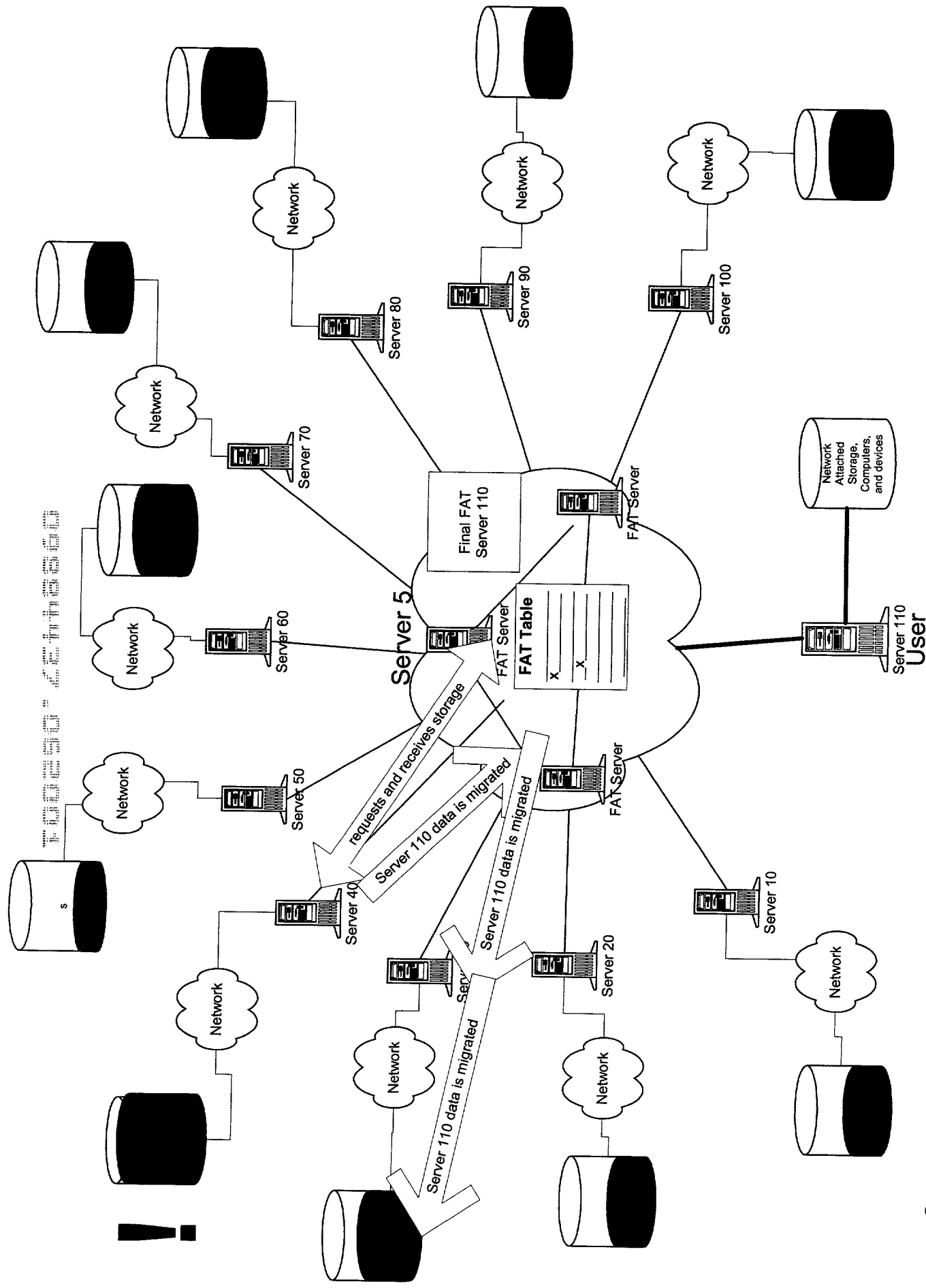


Servers providing storage report back to user to validate that the data was stored successfully. If unsuccessful, or a vendor server is not heard from, then the data will be resent to a new location, and the location will be marked as unused on the preliminary FAT table.

Figure 14

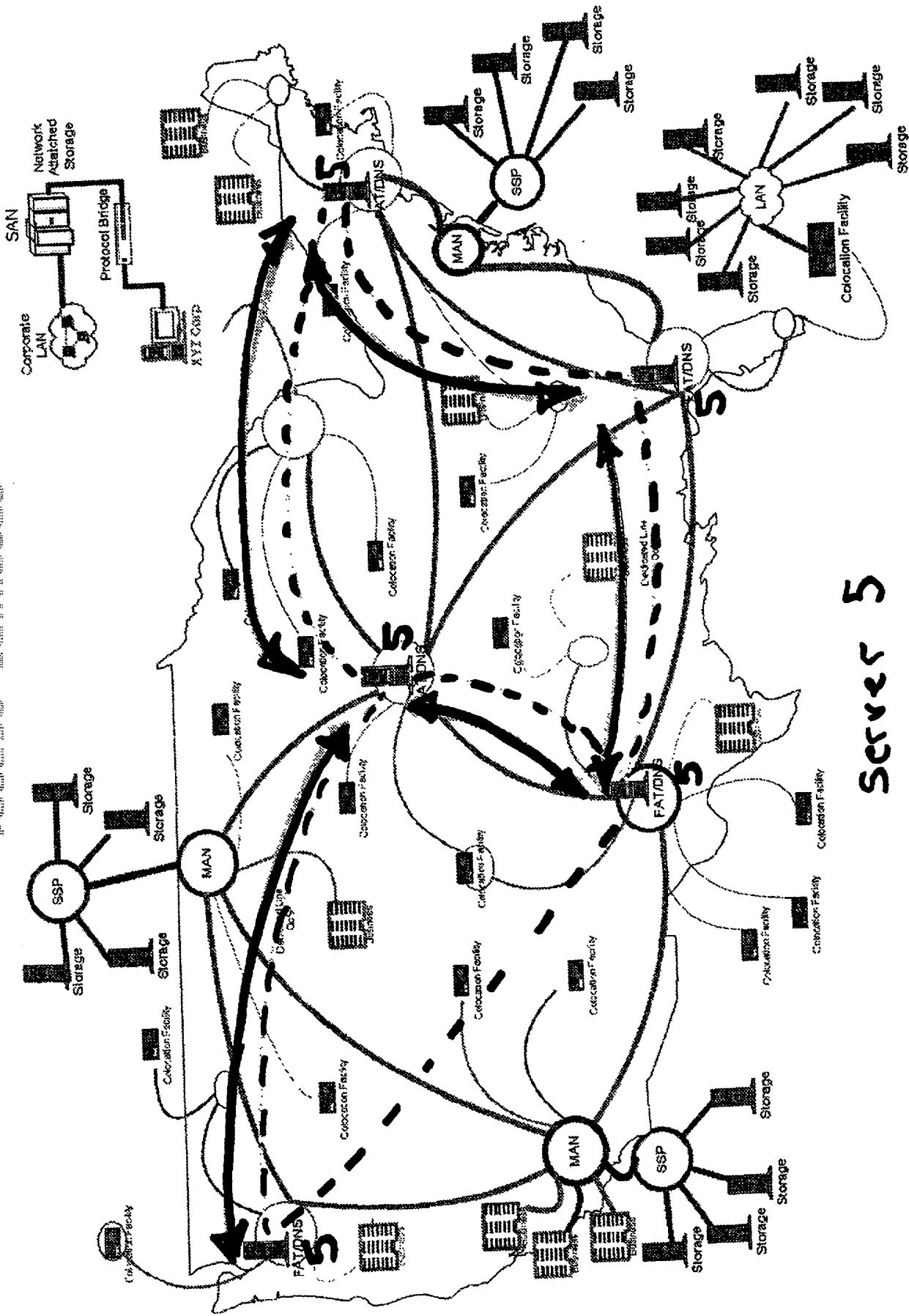


Server 110 compiles a final FAT, identifying where the data finally was stored successfully. Server 110 sends the final FAT table to Server 5 for storage for when Server 110 wishes to download the data back to Server 110 at a later time. Server 5 checks the final FAT, and releases as usable by other Users any location on the Final FAT that Server 110 did not use. Server 5 marks as "used" any server resources allocated and used by Server 110



Server 40 becomes overloaded, and must migrate server 110 data, so server 40 requests storage from server 5. Server 5 allocates storage from the FAT table. After the data has migrated and is validated, Server 5 updates the final fat table for server 110.

Figure 15b



Server 5
----- = Private Network

Figure 15c

FIGURE 15d

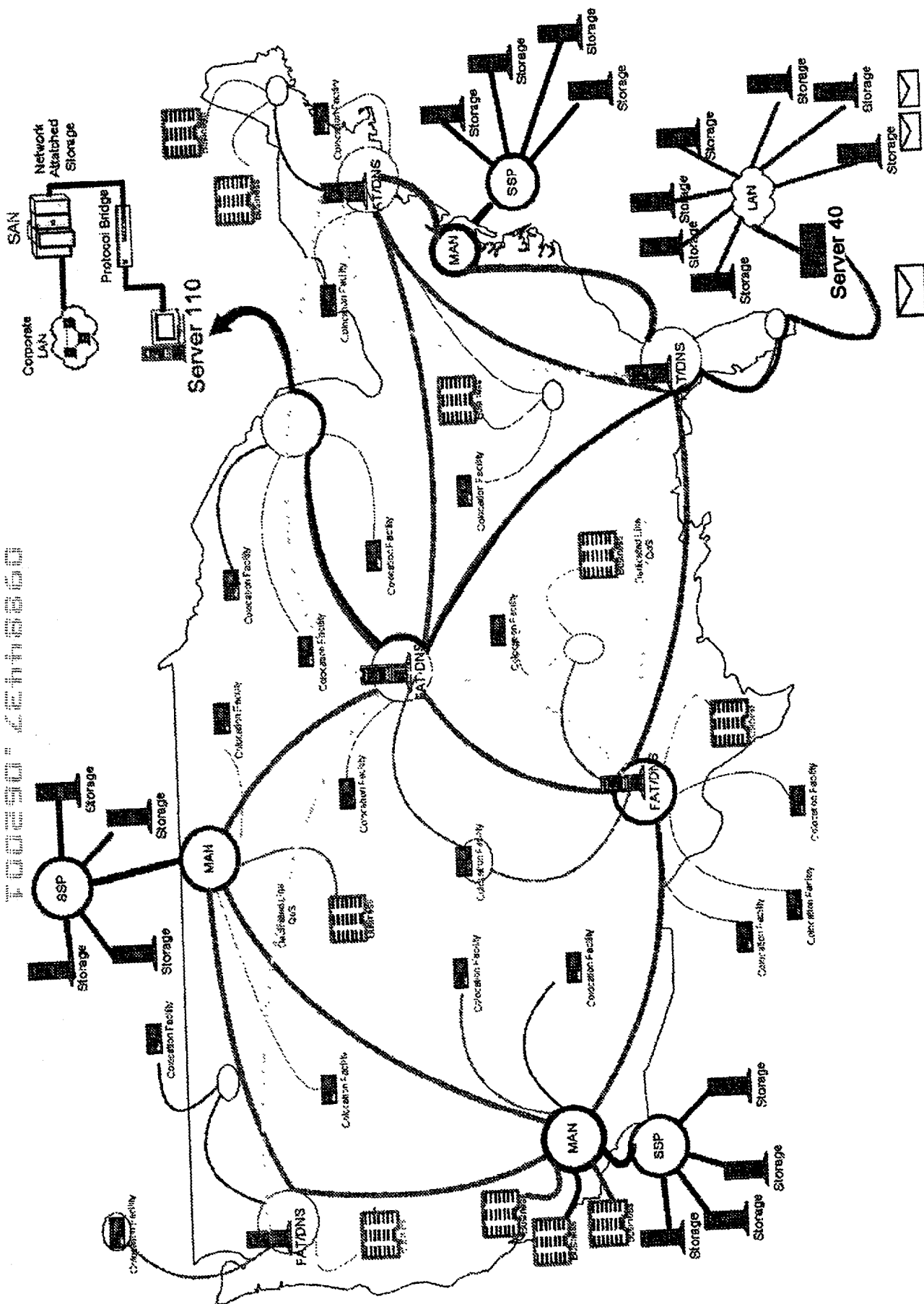


Figure 15d

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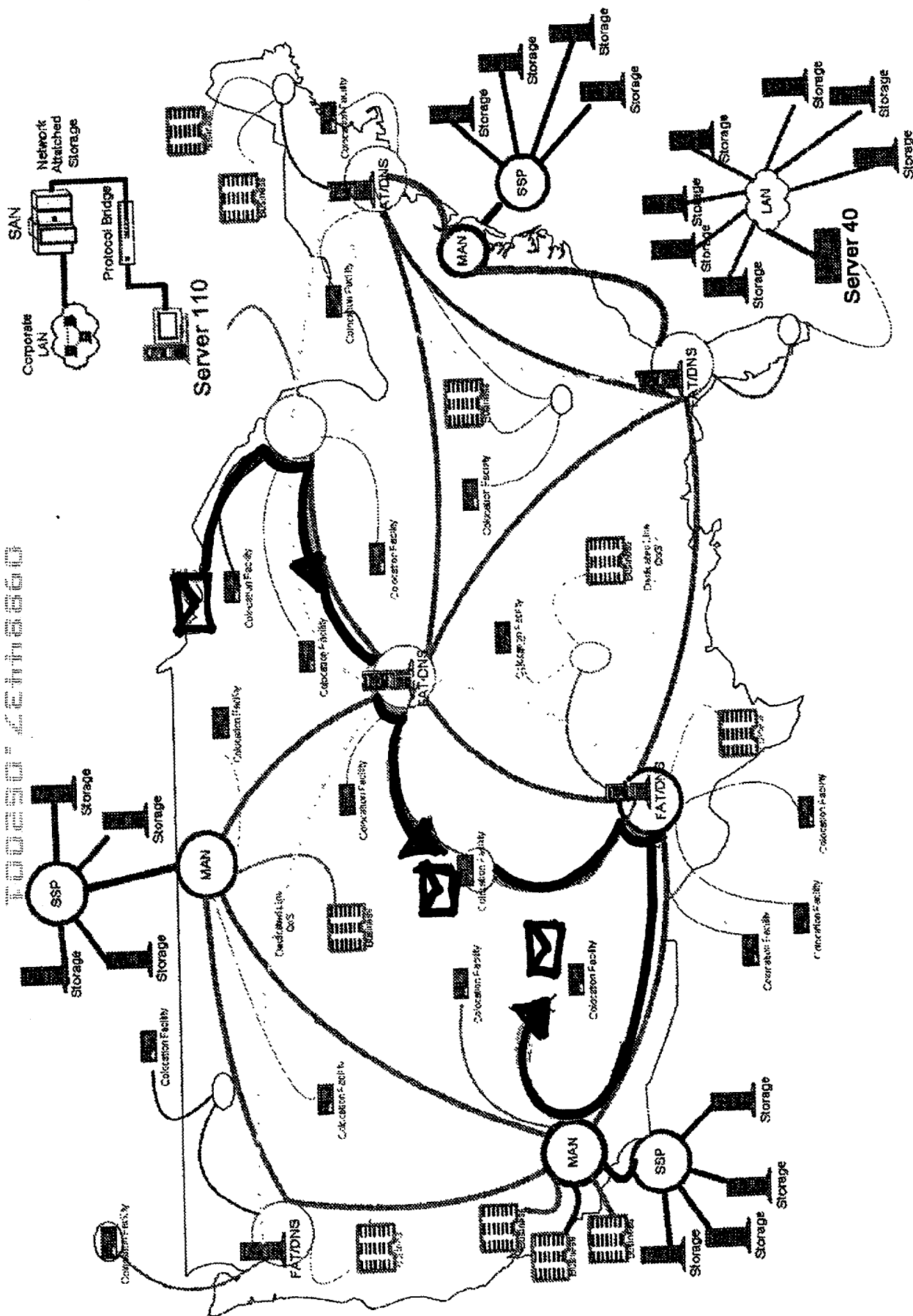
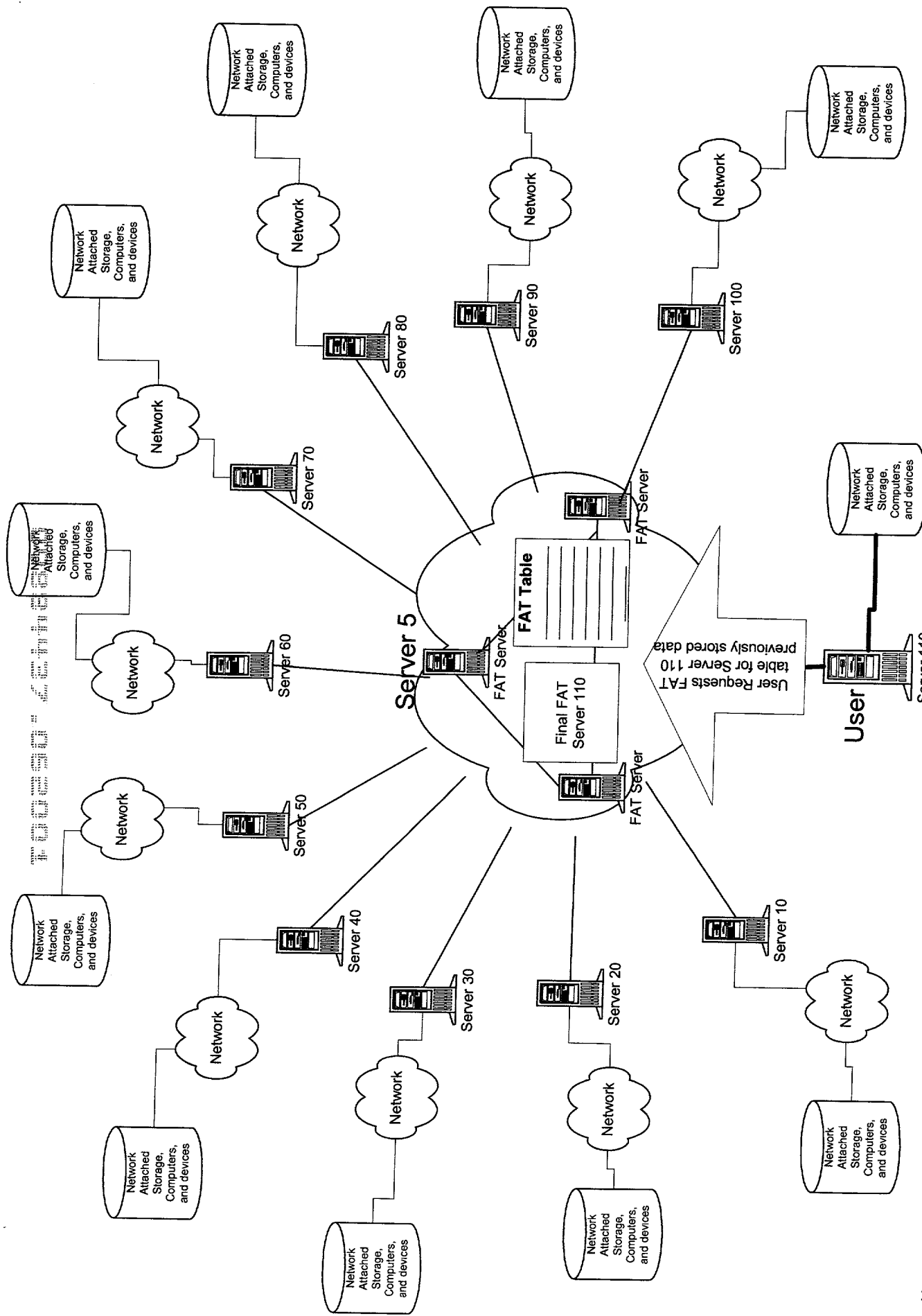
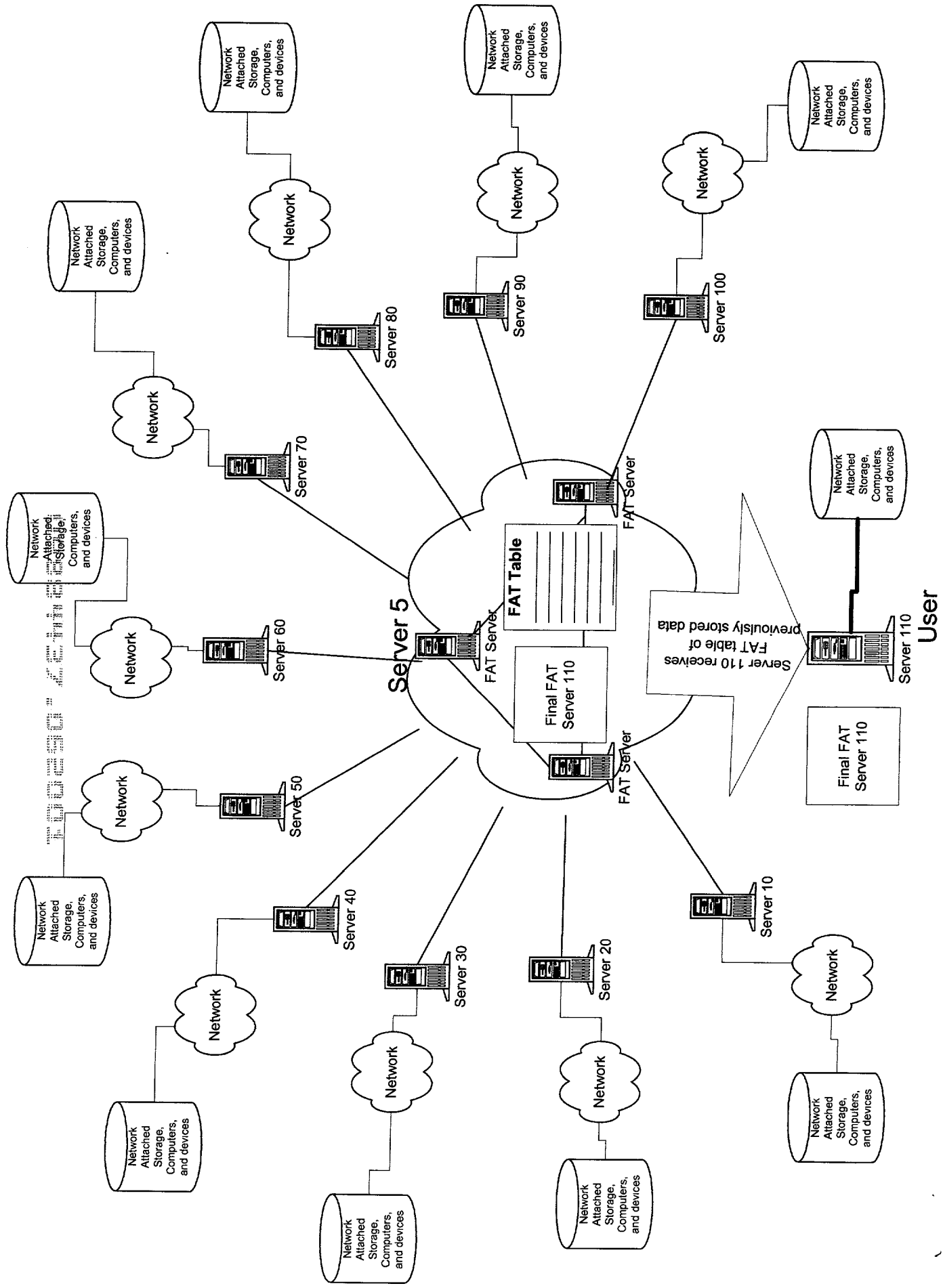


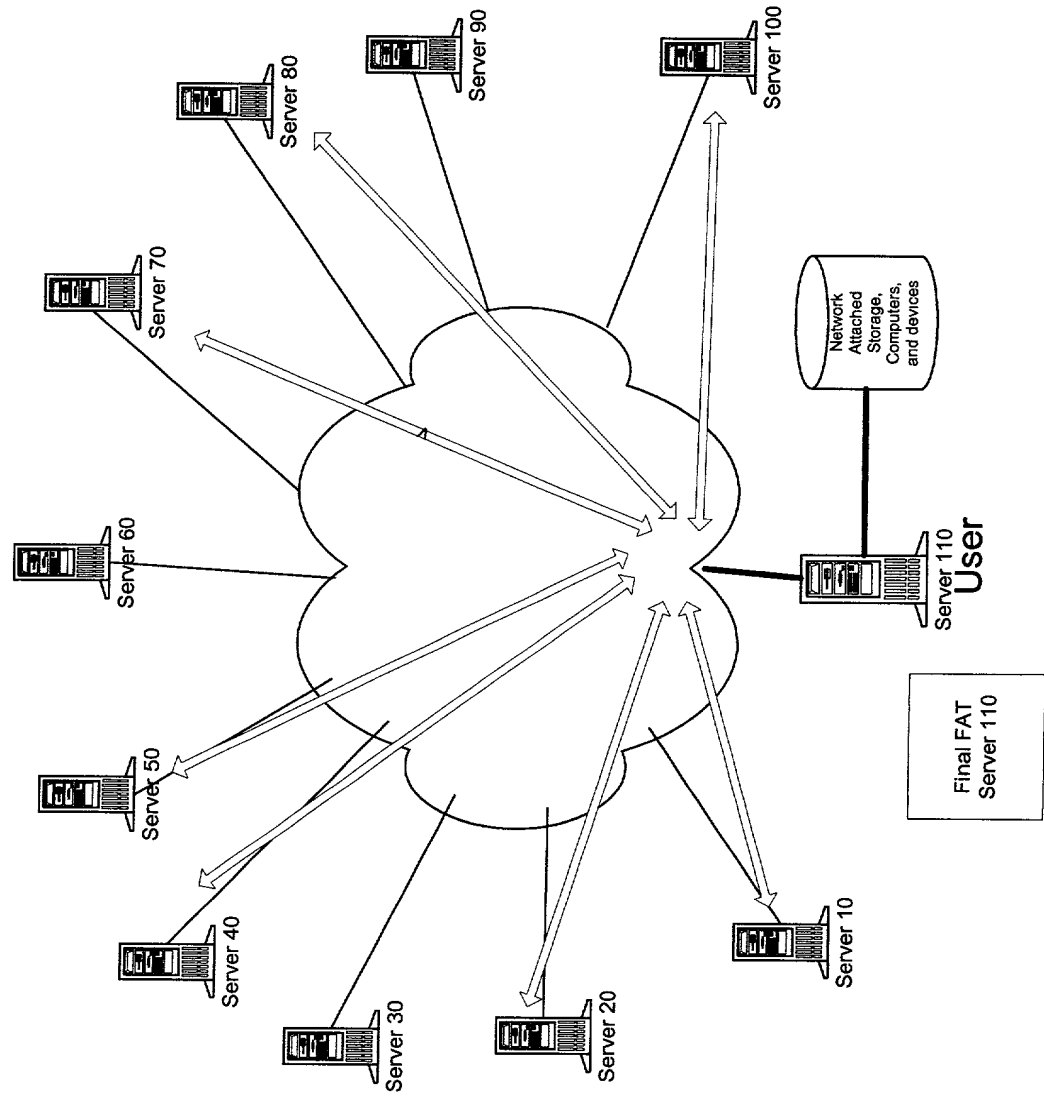
Figure 15e



User wishes to download the previously stored data, which might have migrated since it was offloaded to various servers. User therefore logs onto the Server 5 and requests the authoritative FAT table that indicates where the Server 110 data resides. In the period since server 110 offloaded the data, the data might have migrated due to overloaded conditions on a particular vendor service, in which case the overloaded server would request a storage location from server 5 (as previously shown), and would have moved the data.



Server 110 Sends for and receives its FAT table for all locations of its data, even the duplicate locations for each data chunk.



The user, Server 110, searches for an optimum path to download the data.

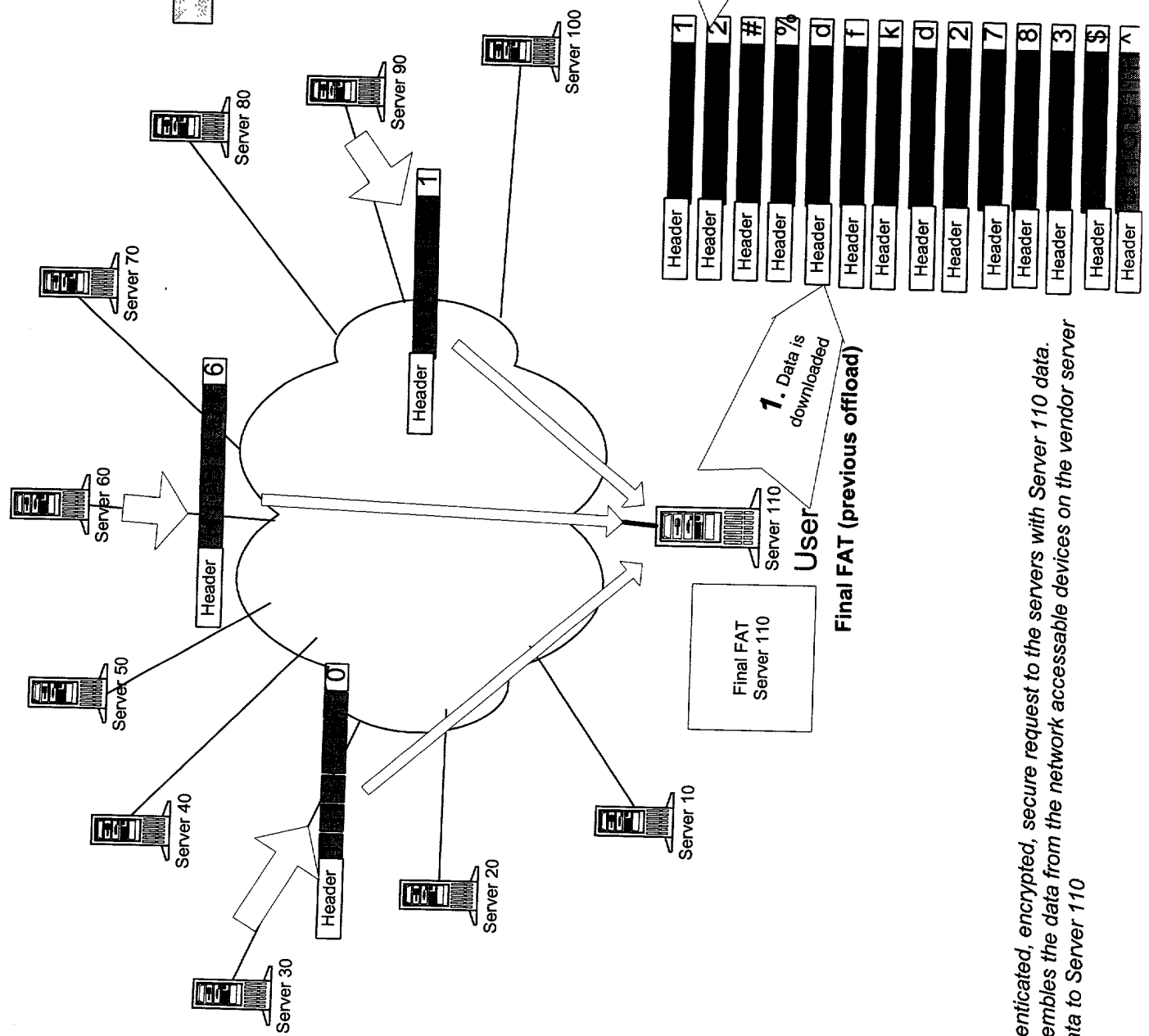
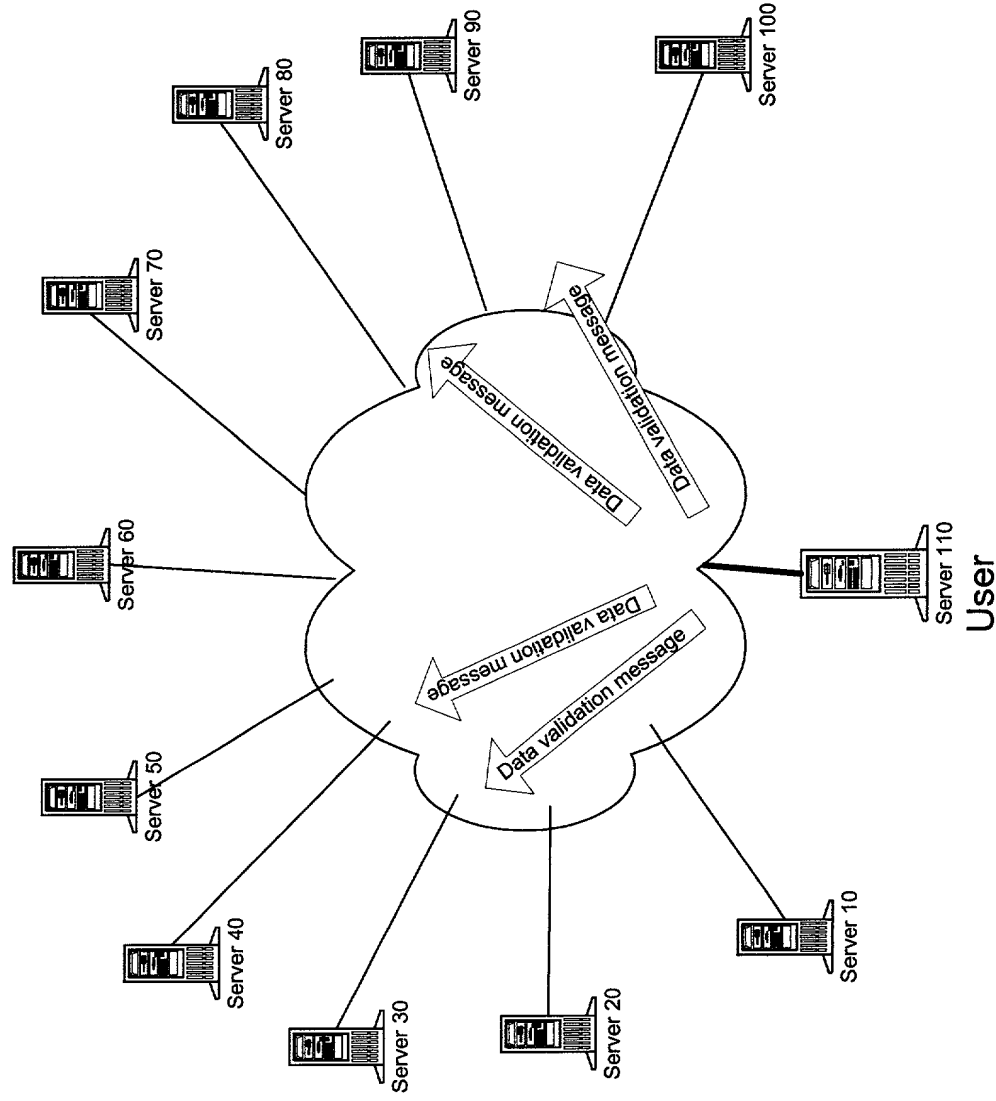


Figure 19

Server 110 sends an authenticated, encrypted, secure request to the servers with Server 110 data. Each vendor server reassembles the data from the network accessible devices on the vendor server network, and sends the data to Server 110



Server 110 sends a data validation message to each of the vendor servers from which it successfully downloaded Server 110 data, confirming that the data was received.

Figure 20

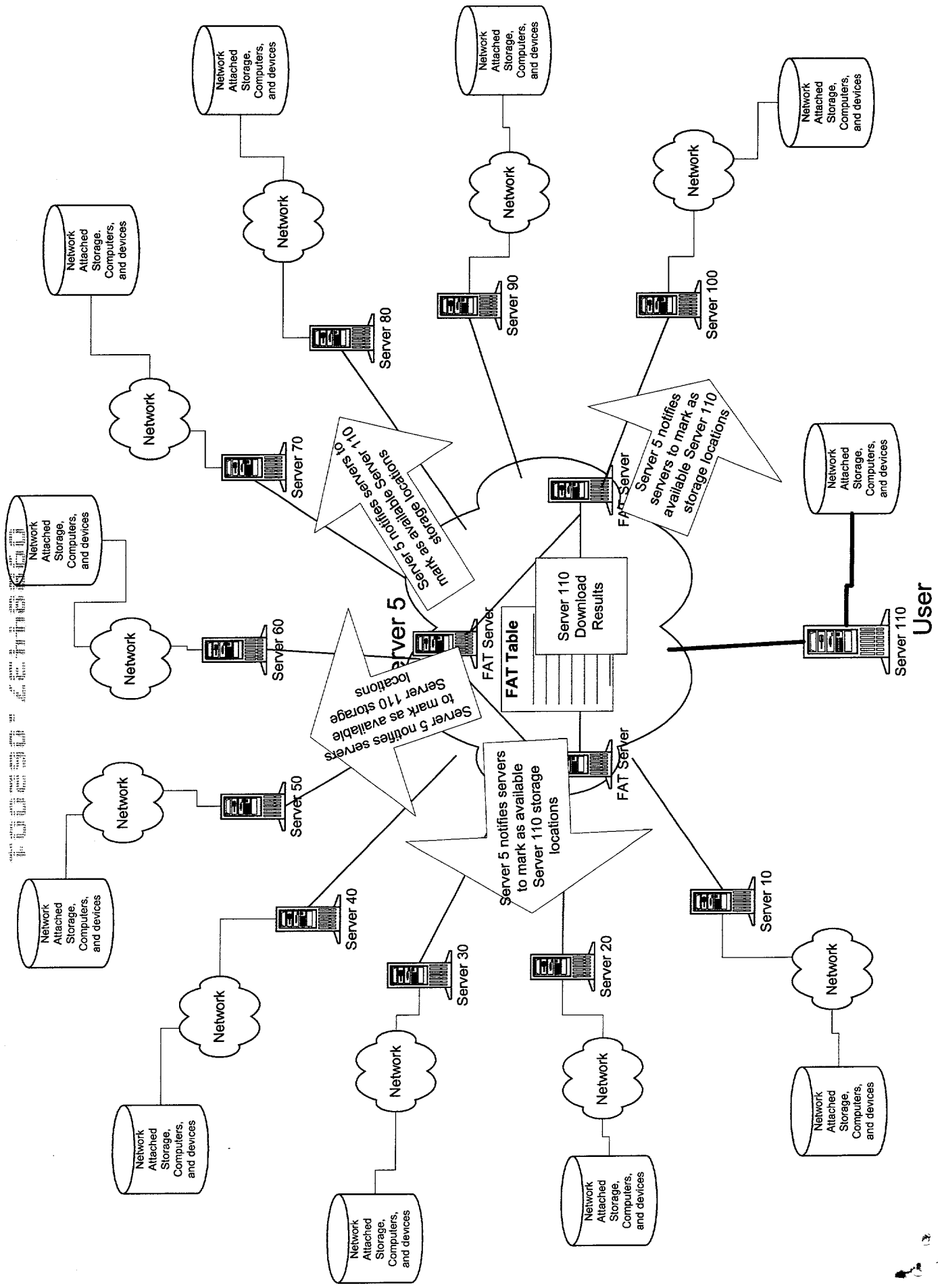


Figure 22

Server 5 notifies the vendor servers that had stored the server 110 data, indicating that the vendor servers can erase the resources previously used by server 110.